RURAL DEVELOPMENT, AGRICULTURE, AND RELATED AGENCIES APPROPRIATIONS FOR 1991

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

SUBCOMMITTEE ON RURAL DEVELOPMENT, AGRICULTURE, AND RELATED AGENCIES

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PART 3

AGRICULTURAL PROGRAMS

	Page
Agricultural Research Service	1
Cooperative State Research Service	223
Extension Service	483
National Agricultural Library	593

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RURAL DEVELOPMENT, AGRICULTURE, AND RELATED AGENCIES APPROPRIATIONS FOR 1991

TUESDAY, MARCH 6, 1990.

DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

WITNESSES

CHARLES E. HESS, ASSISTANT SECRETARY, SCIENCE AND EDUCATION

R. DEAN PLOWMAN, ADMINISTRATOR, AGRICULTURAL RESEARCH SERVICE

MARY E. CARTER, ASSOCIATE ADMINISTRATOR, AGRICULTURAL RESEARCH SERVICE

EDWARD B. KNIPLING, DEPUTY ADMINISTRATOR, NATIONAL PROGRAM STAFF, AGRICULTURAL RESEARCH SERVICE

JOHN R. VICTOR, BUDGET OFFICER, AGRICULTURAL RESEARCH SERVICE

STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

Mr. WHITTEN. The committee will come to order.

We have with us today the Agricultural Research Service, Dr. Hess, Assistant Secretary; Dr. Mussman, and your associates. We would be glad to have your biographical sketches included in the record. Glad to have you, and glad to have you before us.

Dr. HESS. Thank you.

Dr. Mussman was not able to join us this afternoon. He is working on some farm bill activities, but I believe he will be with us tomorrow.

[The information follows:]

CHARLES E. HESS, ASSISTANT SECRETARY OF AGRICULTURE FOR SCIENCE AND EDUCATION

Charles E. Hess was sworn in as Assistant Secretary for Science and Education on May 22, 1989. He is responsible for USDA research and education programs in the food and agricultural sciences, including planning, evaluation, and coordination of the State-Federal activities through various committee structures. The Agricultural Research Service, the Cooperative State Research Service, the Extension Service, and the National Agricultural Library are under his general supervision. He also serves as USDA's Co-Chair of the Joint Council on Food and Agricultural Sciences.

A native of New Jersey, Dr. Hess earned his B.S. degree in science from Rutgers University in 1953. He received M.S. and Ph.D. degrees in horticulture, plant physiology, and plant pathology from Cornell University in 1954 and 1957. From 1956 to 1958, he served as a first lieutenant in the U.S. Army Chemical Corps at the U.S. Army Biological Laboratories in Frederick, Maryland.

He began his career with the Department of Horticulture at Purdue University in 1958. He later became Research Professor and Chair of the Department of Horticulture and Forestry at Rutgers University in New Brunswick, New Jersey. After serving as both Associate Dean and Acting Dean of the College of Agriculture and Environmental Sciences at Rutgers, in 1972 Dr. Hess became the first Dean of Cook College at Rutgers. From 1971 to 1975, he was also Director of the New Jersey Agricultural Experiment Station.

In 1975, Dr. Hess was appointed Dean of the College of Agricultural and Environmental Sciences at the University of California at Davis and Associate Director of the California Agricultural Experiment Station. On January 1, 1988, he assumed the additional post of Director of Programs, Division of Agriculture and Natural Resources, for the California Agricultural Experiment Station and the Cooperative Extension Service.

Dr. Hess was named to Phi Beta Kappa at Rutgers, and in 1983, he received an honorary doctoral degree from Purdue. He has been honored as a fellow in the American Association for the Advancement of Science and in the American Society for Horticultural Science, and in 1988, he received a USDA Award for Distinguished Service.

From 1982-1988, he had a presidential appointment to the National Science Board (National Science Foundation), and in 1987, Secretary Lyng appointed him as Co-Chair of the Joint Council on Food and Agricultural Sciences. He chaired the National Research Council committee to develop a National Strategy for Biotechnology in Agriculture. In addition, he has traveled extensively as an advisor and consultant on agricultural matters.

REMARKS OF THE ASSISTANT SECRETARY

Dr. HESS. Mr. Chairman and members of the subcommittee, I appreciate this opportunity to present our science and education budget proposals. Mr. Chairman, if I may, I would like to have the statement that I prepared incorporated in the record, and I shall give some of the highlights of that to you now.

American agriculture is in a unique position in our history. We have one of the best food and fiber systems in the world, in terms of the consumers. The average citizen spends about 11.8 percent of their disposable income for food, which is the lowest in the world.

However, American agriculture is also facing serious challenges. Our society is becoming increasingly concerned about issues such as food safety, diet, nutrition and health, and environmental issues such as water quality and global climate change.

We are concerned about farm income, quality of life in the communities and competitiveness in the world markets. We are concerned about attracting young men and women into agricultural sciences, and increasing the diversity of that pool.

NATIONAL INITIATIVE FOR RESEARCH

We believe that many, if not all, of these challenges can be addressed through a new investment in science and education. The National Academy of Sciences in its report, "Investing in Research, A Proposal to Strengthen the Agricultural, Food and Environmental System", recommended a bold new research program addressing six major areas of research and using four funding strategies.

The report recommends a new investment in research and education of $500 million per year. That report forms the basis of the National Initiative for Research on Food, Agriculture and the Environment, which is the centerpiece of our 1991 budget proposal.

At the proposed 1991 funding level of $100 million, the initiative would provide funding for four major areas, natural resources and the environment, nutrition, food quality and health, plant systems and animal systems.

With Congressional support for these proposals, the Administration is committed to annual increases of $50 million for this program, bringing it up to an investment of $300 and perhaps $500 million eventually. Our goals for this investment would be increased production efficiency; not necessarily more, but production at lower cost.

New product development, such things as Kenaf and Rapeseed and other new products for our agriculture. We believe that these will help increase farm income through diversified production, through optimizing inputs and reducing risks.

We also think that this would help enhance the quality of life in rural communities, improve health through nutrition and food safety and enhance the stewardship of our environment through more effectively using agricultural chemicals and pesticides, improving water quality and reducing greenhouse gases by using agriculture as a resource for industrial hydrocarbons rather than fossil fuels.

We also believe that this investment would help us increase the size and diversity of our science base. A unique feature is the funding strategies. They are individual research grants, strengthening grants and multidisciplinary research grants, which attract a number of different sciences representing different disciplines to work on a problem such as pest management, for example, which requires entomologists, plant pathologists, economists and so forth.

We also have mission linked grants which will enable us to target specific areas of research important to agriculture. One major area in this category is plant genome study, which would be run by the Agricultural Research Service, in which we would identify those genes that control agriculturally important characteristics, such as insect or disease resistance or drought tolerance.

SUPPORT FOR ONGOING PRIORITIES

We have many challenges, but we also have new tools to address these challenges, such as biotechnology, computers and new instrumentation. We are pleased that the budget proposals provide funds in addition to the national research initiative to strengthen the base of the science and education system we have established over the years.

Therefore, we are proposing increases for the Cooperative States Research Service in Hatch funding and the 1890 institutions to help these institutions offset increased expenses. In addition, we are requesting $25.6 million for special grants to continue priority research of national interest.

Similarly, we have included an increase for the basic extension program to offset higher costs for Smith-Lever and the 1890 institutions formula funds.

ARS LABORATORIES

I would like to highlight a few other areas of our budget. The Agricultural Research Service at its Federal labs represents a significant part of our research base. An area of national interest is the plant and animal germplasm programs.

As you know, we have new techniques to move genes from one organism to another. We must be sure that we have the genes available to move. I would like to emphasize my strong support for a request of $4 million in order to start construction of the new seed storage laboratory at Fort Collins. This is actually a national resource.

We are also requesting $28.6 million for construction of other agriculture research facilities, including the modernization of some of the facilities at Beltsville, replacement of a fruit and vegetable laboratory in Yakima, Washington, and expansion of our poultry laboratory in Athens, Georgia.

I mentioned how I believe that the national research initiative will indirectly help attract young men and women into science and to increase the diversity of that pool. We also propose to directly address this challenge facing America by recommending increases in most of our higher education programs, including the 1890 capacity building grants program, which was initiated with the support of your committee last year.

OTHER FY 1991 BUDGET PROPOSALS

One of the great strengths, indeed uniquenesses of the U.S. science and education systems is the Extension Service. Unlike any Nation in the world, we have a technology transfer capability right into our research and teaching institutions—land grant colleges.

Not only does it serve as a technology transfer mechanism, but it also helps bring problems from the farmers back to the universities, so that we can have a relevance of research and of teaching programs to the farmers' needs.

I mentioned our recommendation for an increase in Smith-Lever. I also want to highlight two other programs. One is an increase of $10.3 million for the Water Quality Education Program, which is part of the Water Quality Initiative in the Department.

We want to put the best, environmentally sound, profitable farm and range practices, the best management practices into use right now, because prevention of contamination is the best approach to ensure ground water quality.

The 4-H youth development programs have a rich history of providing leadership and citizenship qualities, and in providing practical education in nutrition, agriculture and many other areas.

In recent years, some of our State extension programs have begun to address concerns of youth at risk, children who are at risk of failure because of inadequate supervision, such as latchkey kids or single-parent families, poverty, presence of drugs and other factors.

We propose a $10 million matching grant program to support a comprehensive and intensive program, including significant efforts on early childhood development. If we can enhance the chances of success of our youth at risk, return on this investment will be many times over to society.

One of the basic resources of the science and education system is the library. We are fortunate to have the National Agricultural Library here in Washington. It is one of the finest in the world. We propose an increase to help cover increased costs of obtaining science literature from overseas, because we are not the only ones in the research business, and we like to get as much information from overseas as well as what we produce here.

Also, we want to continue improving the electronic data handling system that the National Agricultural Library has developed to form a cooperative library network among the National Agricultural Library and the university libraries throughout the United States.

Mr. Chairman, as my first year as Assistant Secretary draws to a close, I am tremendously impressed with the dedication and talent of the research, teaching and extension professionals in science and education, and I am inspired by the challenges that we face.

We clearly have an opportunity to bring the most advanced technologies to bear on long-term and emerging problems, challenges in the food, agriculture and environmental sectors. It will demand a commitment, we feel, of new resources, and a clear focus on the Nation's highest national priorities.

We have worked hard at developing our program and budget proposals which have been submitted to you. We now look forward to working with Congress to achieve our shared goals.

Mr. Chairman, that is my statement, and I will be prepared to answer questions.

[CLERK'S NOTE.—Assistant Secretary Hess' prepared statement appears on pages 127 through 137.]

Mr. WHITTEN. Thank you very much.

We will proceed with Dr. Plowman's statement at this time.

Dr. PLOWMAN. Thank you, Mr. Chairman, and Committee Members. It is a pleasure to be here today and talk about ARS. I would like to present my full testimony for the record, and then just make a few summary comments.

Mr. WHITTEN. Glad to have you handle it that way.

Dr. PLOWMAN. Also, I would like to insert the response to some of the directives we received from the Congress last year.

[CLERK'S NOTE.—The full text of Dr. Plowman's statement appears on pages 138 through 147. The response by ARS to various Congressional directives appears on pages 148 through 164.]

ADMINISTRATOR'S REMARKS

Dr. PLOWMAN. Today, I would like to report on the overall state of the Agricultural Research Service, and review a bit about some of the progress we made during the last year, and then highlight some of our concerns that we have at present, and also explain our program and budget recommendations.

As you know, the mission of ARS is to conduct research to solve the problems encountered by not only producers, but consumers of farm and ranch products in this country.

I think we have had a very successful year. In the explanatory notes that we provided to the committee, you will find more than 60 examples of rather significant, important accomplishments that we have published this past year in plant and animal sciences, natural resource conservation, post-harvest applications and food safety.

RESEARCH ACCOMPLISHMENTS

I would like to mention a few of those that we are proud of. The first one I would mention is the water erosion prediction project that we have had under way for quite sometime. This past year, we delivered a model for the regulatory agencies, for the Soil Conservation Service and the Forest Service and the Bureau of Land Management to use.

What it does is characterize the land in terms of its erodability; and so now, we have a rather objective measure of land that will erode, and by knowing that farmers can produce better crops and avoid some of the erosion problems they have experienced in the past.

This model will be extensively used across the country. We had another activity that I think is going to be important to us down the road. We imported 144 pigs from China, which was no small feat, I can tell you.

The reason we are doing this is because China has some breeds of pigs that are much more prolific than ours. Litter size is something in the neighborhood of three or four more pigs per litter. If we could incorporate those characteristics into our own domestic breeds of pigs, it would be a real benefit to our pork industry.

We have been doing some work for the Federal Grain Inspection Service trying to characterize wheat in terms of its hardness. That is how wheat is presently marketed, and since there has been a lot of new varieties developed, an objective measurement is needed. We have developed some techniques now that can measure hardness. That should help our marketing system a great deal. Another long-term study that has been going on for longer than I can remember is methods to separate sperm between male and female bearing cells. We are almost ready to say that has been accomplished.

We have had experience now in predetermining the sex of both rabbits and swine with about 75 percent accuracy. Soon we will have that technology ready for industry to adopt, which will be a major contribution.

We have developed a new orange hybrid in Florida that is proving to be a very significant accomplishment. It has some characteristics that are better than anything else that exists in that part of the country.

The recent freeze that occurred in Florida also showed it to have some cold-hardiness that we perhaps didn't expect. So, if there is anything good to come out of the freeze, maybe it will be the opportunity to plant some better trees than the ones that were destroyed.

One of the things you will find in your goody bag is a cupcake. If you can refrain from eating that today, you will find it is still good tomorrow, because what we have done is incorporate fluffy cellulose into it. That is fiber material made from bran, corn and oat bran that retains moisture better, and it has no calories. I like that part. It also tastes good. So, if you need more of those, we will supply them. You will like it.

Mr. MYERS. Do we have to wait until tomorrow?

Dr. PLOWMAN. No, sir.

We are very proud of the fact that Research and Development Magazine honored us this year with one of their R&D Awards for this contribution. We are doing some other things that you will find in our printed testimony that I think you will get just as excited about as we are.

OTHER ACCOMPLISHMENTS

Another real contribution that we think will help agriculture is the recent completion of the construction of Soil Tilth Laboratory in Ames, Iowa. That is really an excellent facility, and it fits in real well with the big thrust in water quality activities.

We are looking forward to fully staffing that facility. It will be a great contribution to the soil and water activities.

Last week, I happened to be down in Oklahoma to attend another award program that was given on behalf of ARS. It was an award called the Historic Site given to ARS for developing vegetative waterways.

They estimate that through the Soil Conservation Service, there has been over 500,000 miles of vegetative waterways put in this country to facilitate the movement of water without causing erosion. The design concepts that we were honored for came out of our laboratory in Oklahoma. We think that is a real good contribution to a large spectrum of users.

FUTURE CONCERNS

I would like to talk just a bit about some of our other concerns we have as we move down through the years, and one of the concerns I have is how we are going to keep supporting and contributing to some of the significant research that we should continue to perform that don't happen to be in the real mainstream of what the public is very concerned about.

It will only be through a dialogue with this Committee that we can enumerate some of those activities. With the problems that we have had in the past few years of absorbing pay costs and taking other reductions, it means that we must continue to reprioritize our activities.

It has been necessary to close some locations. We have less scientists now than a few years ago. So, we have those kinds of concerns that we need to bring to the attention of this committee.

FY 1991 BUDGET PROPOSALS

In our budget for 1991, we are talking about three major thrusts. We have characterized those thrusts in the areas of environmental quality, in food quality and safety, and in the efficiency and profitability of farming.

In the environmental quality program, we are requesting $7.4 million for research toward our ground water contamination problems, and another $7.4 million toward the global climate change activities.

In the 1990 budget, you were kind enough to give us a considerable increase in the ground water contamination problems, and we are well on the road to utilizing those funds.

We have had a very extensive planning process to determine major research needs and where the problems exist. Now we are developing some plans to begin to mitigate those problems.

In the area of global climate change, our work will be centered in two major activities. The first will be to determine the effects of atmospheric gases, temperature and other climate changes might have on food and agriculture production. The other will be to determine what contribution agriculture makes to cause those problems. So, we will be looking at both of those aspects.

In the food quality and safety areas, as you well know, people are becoming much more sensitive to those issues than they have been in the past. We would be the first to say that the quality and safety of America's food is better than anywhere else in the world.

Well, if it is better than anywhere else in the world, it must also be good. But people's perception is that there are hazards in food, and we intend to work very hard to alleviate some of those concerns. We do a lot of work for the Food Safety and Inspection Service in developing more efficient and less costly tests for detecting harmful microorganisms and chemical residues. We will continue to do that.

We are also interested in alternatives to the synthetic pesticide that farmers use now. We want to develop and devise production systems that minimize these potential contamination points.

Those will be the main thrusts in our food quality and safety area. In our budget, we are proposing a $3.6 million initiation project to complement the $15 million request that is in the National Research Initiative to start the genome mapping program.

Our technology is at the point now where we are learning how to move genes around within plants and between plants. That technology is further along than knowing which genes to move. We need to gene map these major crops. We need to find the genes that are responsible for the things we are most concerned with, such as drought resistance, stress resistance to insects, pathogens and so on.

As we characterize those, then it will be possible for us to tailor crops to alleviate these kinds of problems. That is a very important area of work for us. There is another small amount of $2.2 million in the budget request. That will increase our efforts to acquire and maintain and evaluate and enhance the plant and germplasm system. It is really the key to our future. We can't emphasize enough the importance of plant germplasm. Over on the animal side, our program focuses primarily on the important diseases of livestock and poultry and also again on germplasm characterization and enhancement. We request $1.7 million for this activity.

RESEARCH FACILITY NEEDS

Dr. Hess mentioned briefly our priorities for buildings, and you have provided most of the funds to finish the national seed storage laboratory in Fort Collins. However we still need another $4 million to complete that laboratory. That has to be our number one priority. We are at the point now where we almost have to tell people to quit sending germplasm there. We are no longer able to accommodate it. Having this germplasm available for all of the plant breeders in the country is much needed now and in the future, to improve crop productivity. It is absolutely critical that we move along and finish that facility. Beltsville has been a high-priority need also. This committee has been very helpful in past years in helping us with updating and modernization of that facility.

We are asking for $16 million more to continue with what we are doing now. We have had a deficiency study, and we are developing a very detailed plan on how best to accomplish the necessary work. We should have the plan ready in the next few months, which we will provide to the committee.

The third item on our facilities list is the Fruit and Vegetable Research Laboratory in Yakima, Washington. It needs to be funded at about $10.1 million. Again, this facility directly targets biology, ecology and control of insects and mite pests on fruits and vegetables and field crops.

This laboratory is especially important in light of EPA's reduction in approved pesticides that can be used to protect fruit and vegetables. This laboratory will speak directly to those kinds of issues.

In addition, we are asking for $2.5 million to add a wing to our already existing laboratory on poultry diseases in Athens, Georgia. We think that is a very cost-effective method to enlarge our program down there. We already have one research wing and a competent staff working on the problems of avian influenza, salmonella and Newcastle disease. It would be very helpful to expand that facility.

This concludes my statement Mr. Chairman, we would be pleased to respond to any questions that you or the committee might have.

ACCOMPLISHMENTS OF THE COMMITTEE

Mr. WHITTEN. Thank you both very much for your presentation. I am very proud of what we have accomplished over the years in providing funds in the field of research. As I frequently say, if we hadn't had research, we would all be hungry today.

The records show, I believe, that every five years we have to develop new seed. We are proud of your efforts it goes back a long way. Every dollar you have had appropriated for research, originated in this subcommittee. We have approved 99 percent of it in the original bill, or in the conference.

I met today with a representative of the National Soybean Association. When I came here, soybeans were a cull crop, because you couldn't keep them from falling out on the ground. About every fourth year, you would have to get seed, because you would have a complete flat.

As machinery was developed for use in harvesting, it led us to have to try to get fruit and other things where they mature all around the same time. We have gone through that period. We have gone through all of these things. We are familiar with it.

BUDGET REDUCTIONS

But as we see your request today the Department of Agriculture is cutting 65 activities of the Department for a total of $1.4 billion. They propose these cuts so they can show some increase. Loan levels are cut $3.470 billion. Now, that is the recommendation in the President's budget.

COMPETITIVE GRANTS

A few years ago, we had the farm credit system cut out from their annual report to Congress. I advised against it at the time. They got away with it, and didn't have to report to Congress. We insisted that they keep bringing before us the recommendations for their overhead. We had to bail them out this year, you may recall.

I see that you want to cut out $42 million which we had given in special research grants. This is a big country, there is a whole lot of difference between Florida and Alaska and Mississippi and Nevada and all the rest.

The records show that what will prosper in one area of the country will not prosper in another. But you take $42 million from special grants, which require a report to Congress and we have a chance to look after our colleagues, and put it in competitive grants, where you can favor the big universities that suit you.

I would be hesitant to go along with this, because with competitive grants you avoid the annual review of Congress on these projects. When I started in Congress some years ago, we had all the military research centered in a few large universities. That happened because we had an eastern university who decided who was qualified and a university on the West Coast who decided who was qualified.

When they had the privilege of saying who could and who couldn't, it just about dried up the source of funds for research because Congressional support was lost. May I say that we went along with your recommendation last time. We made a study to see how much of the money went to overhead, in one case all of the money went to overhead.

The others were about 50 percent overhead. We put a limitation of 25 percent on overhead costs, and it increased the money available for research by about $3.5 million. So, I don't buy this thing unless you can show something special to me.

In many cases, it is your big, heavily endowed universities that don't need the money that get the grants, but they, of course, will take money where they can get it, and use the money as they want to, if you leave them alone.

It is a harsh criticism, but factual, and which I can prove. What is your justification taking $42 million away from special projects when we have approved it; where people are interested in it, and where they had it? You took it away to do what you wanted to do.

Dr. HESS. Mr. Chairman, we appreciate the role of special grants.

Mr. WHITTEN. You don't look like you appreciate it much. I am telling you like it is.

Dr. HESS. This year, we have included in our budget proposal $25 million worth of special grants. Last year, it was $15 million.

Mr. WHITTEN. It shows you are asking for $100 million this year for competitive grants and $42 million of that was taken from special grants.

Dr. HESS. In previous years, the special grants category had been placed at zero in our proposal.

Mr. WHITTEN. You feel you have completed your job? Now you feel you can do with the money what you want?

Dr. HESS. We have included in our budget proposal some of the special grants, for example——

Mr. WHITTEN. You want to put the money where you want, instead of us dividing it and keeping the support of the Congress.

Dr. HESS. We would like to attract the best minds to deal with some of the challenges.

Mr. WHITTEN. Is there anything better than having support for the money in Congress? You are risking the support we have in the Congress for what you think would be helpful to you.

Dr. HESS. No sir. We are trying to do research that is of interest to American agriculture.

Mr. WHITTEN. The first thing about your research is to get the money with which to do it. You are risking losing the money. When I go to the Floor of the House and tell all my colleagues, they have cut this out because they have somewhere else they want to put it.

We have to watch you sometimes, to keep public support.

Dr. HESS. Sir, we have looked at the distribution of the competitive grants——

Mr. WHITTEN. This is right and they are all your friends. I have looked at it already. I am serious. You do a great job. But the first thing you have to do is get the monies through the Congress, 435 House Members, 100 Senators, and then signed by the President.

You don't realize there is much of a job in that, do you?

Dr. HESS. I appreciate it very much, sir.

Mr. WHITTEN. It leaves us faced with a serious situation. I am not trying to discount it at all, but just about every university that you would favor does not need these grants insofar as their operations are concerned. That doesn't mean that every university isn't out looking for money.

They will take everything they can, all of them. There are a whole lot of other things like that throughout the country, not just the universities. But I do seriously question the judgment of those who made this proposal. I don't think you realize what a job it is for us to get funding for those programs through an urban Congress.

Every year the budget proposes to cut out the city gardening program. I come from a rural area, as you know, and people ask me why are you so interested in city gardening? I say, how else would you get the votes of members from Chicago, New York or Los Angeles.

One of the problems we have in agriculture is that the small farmer is going out of business in many areas. Seventy million acres of land lie idle. The problems getting bigger and bigger and harder and harder to handle. The reason I put rural development ahead of agriculture in the name of the subcommittee is not because it is ahead, but because we are trying to keep support in the Congress.

ECONOMIC IMPORTANCE OF AGRICULTURE

Agriculture has been the biggest dollar earner in world trade. Now, world trade is about $140 million in the red. I have tried to tell them, you let the farmer go down and it is not going to stop there. It is going to reach the government. We have a $3 trillion deficit. As I see it, we are going to have to produce more than we use, export what was normal in world trade and only import what we need.

Don't just look after the favored nations by letting them dump everything over here. I have been working with this a long time, as you know.

I asked the Secretary of Agriculture about this, going around asking foreign countries to let our commodities in. Of course not. They just come up with another excuse. England, for example, wouldn't let us sell cattle over there, because of hoof-and-mouth disease. They had it, and we didn't. Foreign countries always come up with something to keep our commodities out.

All of this is borne out by the record. So, if we don't go along with you, I just wanted you to know why and I hope we can be fair about it, I want the record to show why we may take that attitude.

I am like you. I have to get along with the subcommittee. We have to get along with the full committee. So, I can't have my way, but I can make the record show what the effect is.

Dr. HESS. Mr. Chairman, the investments in agriculture research have some of the highest returns of any investment in research.

Mr. WHITTEN. That is right, but you want to turn it over. You are bragging on what we have been doing. What are you going to do that improves on that, and who will get the benefits outside of the major universities?

Dr. HESS. The Delta Council showed that for every dollar invested in research——

Mr. WHITTEN. Under our supervision——

Dr. HESS. They had $40 return.

Mr. WHITTEN. This is why I hate to see you tangled up.

Dr. HESS. Sir, there are, as I indicated——

Mr. WHITTEN. You are going to improve on it by cutting it out. You wouldn't want this unless you thought it was better?

Dr. HESS. Absolutely. I believe——

Mr. WHITTEN. It would be hard to do better, wouldn't it?

Dr. HESS. No, sir, I think we can always do better. I feel——

Mr. WHITTEN. If you keep your eye on them.

MISSION LINKED GRANTS

Dr. HESS. Part of the proposals are what we call mission-linked grants, where we would specify exactly the type of research that we would like to do. So, we can address problems which are important to agriculture.

Mr. WHITTEN. Describe what it is that you will improve over what we have now.

Dr. HESS. As an example, we are working on the biotechnology and the ability to move genes from one plant to another. From a bacteria——

Mr. WHITTEN. I agree with you about high technology, but I believe we have to keep what we have until that delivers. That is pie in the sky.

Dr. HESS. Sir, we had cotton plants in Mississippi this year that had a gene from a bacteria that gave them insect resistance, which will mean less cost to the farmer because of less pesticides——

Mr. WHITTEN. We have had new seed invented here and gone through the thing of how long it would take to have enough of the new seed to plant. I am sure that you have every reason to believe you are sound, but I have every reason to question whether you hadn't better forget about shaking up what you have, and instead keeping what you have until you prove these new things on the smaller scale.

Dr. HESS. We are actually proposing from our perspective that there is a new investment, additional research dollars.

Mr. WHITTEN. You think your approach is correct.

Dr. HESS. What we are proposing is a balanced approach between——

Mr. WHITTEN. You haven't found the cure for swamp fever in mules, have you? Do you know that story?

Dr. HESS. I will have to ask Dr. Plowman about that.

Dr. PLOWMAN. I am staying out of this argument.

Mr. WHITTEN. You spread this around, usually they turn to Mr. Dewhurst. I don't speak for the committee. I am just making the record. The full committee will decide these things.

Let me now turn to some specific questions about your programs.

WATER QUALITY AND QUANTITY

Research by the Department of Agriculture in the field of water quality and quantity continues to increase. Would you please describe for the Committee the efforts ARS has underway in the field of water quality and quantity and what your plans are for the coming year?

Dr. PLOWMAN. ARS has a broad spectrum of research related to water quality management. This research is conducted at 54 locations in 25 States, and is funded at $38.5 million. The two major thrusts of the work include: First, new and improvement management practices, e.g., the development of a range of soil, water, plant, and chemical management practices for reducing the movement of sediments, agricultural chemicals, salts, and toxic chemicals into surface and subsurface waters; and second, decision making aid, e.g., the development of environmental models for assisting farmers, farm consultants, and action agencies in selecting farming practices and production systems that are economically viable and have the potential to reduce the risk of water quality degradation.

ARS' effort will be directed toward technologies for preventing the leaching of pesticides and nitrogen fertilizers into ground water, development of new and more diversified production systems for these major crop producing areas, improved documentation of the sources and amounts of potentially hazardous chemicals in the groundwaters underlying intensively farmed areas of the southeast, and the development of new crop varieties that have greater resistance to damage from insects and diseases and an increased capacity to extract nutrients from the soil.

WATER QUALITY RESEARCH BY LOCATION

Mr. WHITTEN. Please provide for the record a table showing where ARS carried on water quality and quantity research, indicating the dollars available for research at that location.

[The information follows:]

Water quality research by location

Location	*Fiscal year 1990 available*
Phoenix, AZ	$698,500
Tucson, AZ	499,100
Albany, CA	111,100
Davis, CA	182,500
Fresno, CA	347,400
Riverside, CA	1,940,000
Akron, CO	146,500
Ft. Collins, CO	1,845,000
Newark, DE	220,400
Ft. Lauderdale, FL	131,700
Orlando, FL	85,200
Byron, GA	208,500
Tifton, GA	2,159,200
Boise, ID	165,300
Kimberly, ID	656,100
Peoria, IL	200,600
Urbana, IL	548,200
West Lafayette, IN	596,600
Ames, IA	2,314,600
Ankey, IA	215,100
Manhattan, KS	193,100
Baton Rouge, LA	425,200
Houma, LA	187,700
New Orleans, LA	278,700
Beltsville, MD	2,967,800
Frederick, MD	228,300
Morris, MN	768,000
St. Paul, MN	624,900
Mississippi State, MS	272,900
Oxford, MS	2,556,600
Stoneville, MS	1,360,800
Columbia, MO	512,600
Lincoln, NE	1,139,900
Fargo, ND	148,800
Mandan, ND	134,700
Columbus, OH	253,000
Coshocton, OH	775,500
Wooster, OH	362,200
Durant, OK	1,478,600
El Reno, OK	94,900
Stillwater, OK	165,100
University Park, PA	914,400
Wyndmoor, PA	297,500
Florence, SC	343,800
Brookings, SD	819,800
Bushland, TX	79,200
College Station, TX	69,100
Temple, TX	228,600
Weslaco, TX	106,900
Prosser, WA	204,100
Pullman, WA	543,800
Yakima, WA	562,700
Kearneysville, WV	540,100
Shepherdstown, WV	1,090,100

Location	*Fiscal year 1990 available*
Headquarters	3,476,300
Total	37,477,300

GLOBAL CHANGE

Mr. WHITTEN. The Budget Summary for the Department of Agriculture shows the ARS funding level for global change at $1.1 million, increasing to $8.5 million for fiscal year 1991. However, in last year's hearings you advised the Committee that just in global warming alone ARS was spending $22.6 million for fiscal year 1990. How does the $22.6 million reconcile with the $1.1 million shown on page 22 of the USDA Budget Summary?

Dr. PLOWMAN. The $1.1 million budget figure shown on page 22 of the USDA Budget Summary are for research specifically appropriated to meet the goals of the U.S. Global Change Research Program being coordinated under the auspices of the Federal Coordinating Council on Science Engineering and Technology Committee on Earth Sciences. CES refers to these resources as "focused." In addition, ARS research carried for other purposes contributes toward solving the problems identified by the GCRP. CES refers to these resources as "contributing." The funding level reported to the Committee last year for global change included both contributing and focused resources.

Mr. WHITTEN. What is USDA currently doing in the area of global warming and what are the plans for fiscal year 1991?

Dr. PLOWMAN. With funds specifically appropriated for global change research, ARS is currently conducting research to determine what the effect of elevated levels of ultraviolet-B, UV-B, radiation, resulting from thinning of the stratospheric ozone layer, will be on the health and productivity of crop plants. In addition, the ARS acid rain research program is now being included as part of the ARS-focused global change research program. As I indicated to you in last year's Hearings, ARS also conducts other contributing research. Part of this is in cooperation with the Department of Energy to determine the direct effect of increasing carbon dioxide concentration on vegetation. The plans for additional research in FY 1991 supplement some of these programs and initiate others. Our plans for 1991 include expanding the studies with the Department of Energy to predict the impact of rising levels of carbon dioxide of crops and undesirable vegetation to include development of models based on fundamental physiological processes and mechanisms by which plants respond to the environment; with needed support, increasing hydrology research that leads to models that predict the impact of changed temperature and precipitation on water available for agriculture; assembling the existing ecosystem models and databases in a single location and making them available to scientists to determine priorities for research to fill important gaps; and developing a program to measure the fluxes to trace greenhouse gases from agriculture, as well as developing mechanistic models to serve as a basis for reducing it.

GLOBAL CHANGE RESEARCH LOCATION

Mr. **Whitten**. Would you please provide for the record a listing of ARS facilities that are doing work in the area of global warming and indicate the budget for fiscal years 1990 and 1991?

[The information follows:]

GLOBAL CHANGE RESEARCH LOCATION

Location	Global Climate Change	
	FY 1990 available	FY 1991 estimated
Auburn, AL	$1,320,500	$1,570,500
Phoenix, AZ	918,200	1,418,200
Davis, CA		200,000
Fresno, CA	790,000	790,000
Riverside, CA	939,900	939,900
Fort Collins, CO	2,980,300	3,480,300
Gainsville, FL		300,000
Tifton, GA		250,000
Kimberly, ID	1,210,100	1,210,100
West Lafayette, IN	1,457,600	1,457,600
Beltsville, MD	3,474,400	4,974,400
Oxford, MS	2,111,500	2,111,500
Stoneville, MS	883,700	883,700
Columbia, MO	815,600	815,600
Raleigh, NC	1,074,000	1,324,000
Durant, OK	1,188,400	1,188,400
Bushland, TX	1,409,300	1,409,300
Temple, TX		250,000
Pullman, WA	890,600	890,600
Beckley, WV	854,100	854,100
Headquarters, NPS		3,415,000
Total	22,318,200	29,733,200

Mr. **Whitten**. Would you also provide for the record the details of where the $1.1 million would be spent in the area of global change, which was identified in the Budget Summary?

[The information follows:]

These funds consist of $0.7 million allocated to determine the effect of UV-B radiation on crops and approximately $0.4 million reprogrammed from the acid rain program. Part of the UV-B research is conducted in Beltsville, Maryland, ($0.3 million); the remaining part of the UV-B work and all of the acid rain research is conducted in Raleigh, North Carolina.

Acid Rain, Raleigh, NC	$371,800
UV-B-Crops, Raleigh, NC	395,500
UV-B-Crops, Beltsville, MD	296,700
Total	1,064,000

GLOBAL CHANGE COORDINATION

Mr. **Whitten**. On page 7-15 of the notes you refer to research on global climate change as "nationally coordinated research." Who coordinates this research at the national level and how?

Dr. **Plowman**. This research is coordinated through the President's Science Advisor's Federal Coordinating Council on Science Engineering and Technology. Specific responsibilitly is delegated to the Committee on Earth Sciences through its Work Group on

Global Change Research, which has representation from all Federal agencies participating in Global Change Research Program.

LOW-INPUT SUSTAINABLE AGRICULTURE

Mr. **Whitten**. Would you please describe for the Committee in detail the work ARS has underway in the field of low-input sustainable agriculture?

Dr. **Plowman**. ARS has research underway to conserve and improve soil and water resources, to reduce contamination of the environment, and to decrease the costs of inputs per unit of output. Each of these objectives is essential to environmentally and economically sustainable agriculture. We will provide a list of the categories of research contributing to those objectives for the record. There are 735 projects in these categories. About 75 percent will also contribute to the LISA objective of lowering amounts of manufactured chemicals used. ARS and LISA program managers coordinate closely to assure that ARS understands LISA objectives and needs. ARS has cataloged this research so that LISA grant recipients and proposal writers can identify locations where there is research underway pertinent to sustained management systems which they are attempting to develop.

[The information follows:]

Sustainable agricultural research

[In thousands of dollars]

Areas of research	*Fiscal year 1990 available*
Biocontrol of crop pests	$38,835
Plant variety development to reduce input per unit of output	20,638
Management practices to conserve and improve soil, water and air—and optimize production	31,122
Animal, range and forage systems to reduce input per unit of output	4,796
Management to improve pesticide use and food quality	7,670
Enhancement of agriculture energy sufficiency	3,136
Total	106,197

LOW-INPUT SUSTAINABLE AGRICULTURE

Mr. **Whitten**. At what locations is this work carried out and what is the proposed budget for fiscal years 1990 and 1991?

[The information follows:]

LOW-INPUT RESEARCH LOCATIONS

Location	Fiscal year 1990 available	Fiscal year 1991 estimated
Albany, CA [WRRC]	2,187,500	2,187,500
Auburn, AL	562,800	562,800
Aberdeen, ID	537,300	537,300
Akron, CO	159,100	159,100
Ames/Ankeny, IA	3,288,500	3,588,500
Athens, GA	273,200	273,200
Beckley, WV	1,474,900	1,474,900
Baton Rouge, LA	999,200	1,199,200
Beaumont, TX	291,200	291,200
Behoust, France	247,100	247,100
Beltsville, MD	14,912,400	15,412,400
Booneville, AR	612,600	612,600

LOW-INPUT RESEARCH LOCATIONS—Continued

Location	Fiscal year 1990 available	Fiscal year 1991 estimated
Boise, ID	318,000	318,000
Bozeman, MT	1,362,500	1,362,500
Brookings, SD	925,200	925,200
Brownwood, TX	705,200	705,200
Bushland, TX	1,392,300	1,392,300
Byron, GA	398,900	398,900
Canal Point, FL	123,400	123,400
Charleston, SC	985,600	985,600
Cheyenne, WY	628,000	628,000
College Station, TX	1,999,700	1,999,700
Columbia, MO	2,107,800	2,107,800
Columbus, OH	482,400	482,400
Corvallis, OR	910,800	910,800
Coshocton, OH	320,000	320,000
Davis, CA	153,900	153,900
Durant, OK	445,300	645,300
E. Lansing, MI	227,600	227,600
El Reno, OK	420,100	420,100
Experiment, GA	423,200	423,200
Fargo, ND	2,274,100	2,274,100
Fairbanks, AK	155,700	155,700
Florence, SC	1,249,000	1,649,000
Fort Collins, CO	3,125,600	3,125,600
Frederick, MD	1,125,200	1,125,200
Fresno, CA	101,800	101,800
Gainesville, FL	2,468,400	2,668,400
Geneva, NY	196,600	196,600
Honolulu, HI	983,900	983,900
Houma, LA	356,500	356,500
Ithaca, NY	1,063,800	1,363,800
Jackson, TN	117,200	117,200
Kearneysville, WV	1,316,900	1,316,900
Kimberly, ID	462,700	462,700
Lane, OK	186,900	186,900
Lincoln, NE	609,900	609,900
Logan, UT	595,000	595,000
Lubbock, TX	580,700	580,700
Madison, WI	463,800	463,800
Mandan, ND	532,000	532,000
Manhattan, KS	776,900	776,900
Mayaguez, PR	360,300	360,300
Miles City, MT	96,200	96,200
Mississippi State, MS	4,012,100	4,012,100
Morris, MN	1,585,500	1,585,500
Newark, DE	619,900	619,900
Natl. Arboretum [DC]	374,200	374,200
New Orleans, LA	716,900	716,900
Orlando, FL	1,535,100	1,535,100
Orono, ME	203,400	203,400
Oxford, MS	1,279,000	1,279,000
Pendleton, OR	685,100	685,100
Phoenix, AZ	2,070,500	2,270,500
Peoria, IL [NRRC]	2,458,000	2,458,000
Prosser, WA	1,270,000	1,270,000
Pullman, WA	1,605,500	1,805,500
Raleigh, NC	1,223,100	1,223,100
Riverside, CA	937,800	937,800
Rome, Italy	617,400	617,400
Salinas, CA	454,200	454,200
Shafter, CA	259,200	259,200
Sidney, MT	238,800	238,800
St. Paul, MN	2,172,500	2,372,500

LOW-INPUT RESEARCH LOCATIONS—Continued

Location	Fiscal year 1990 available	Fiscal year 1991 estimated
Stillwater, OK	941,300	941,300
Stoneville, MS	7,362,900	7,562,900
Stuttgart, AR	168,900	168,900
Suffolk, VA	474,900	474,900
Temple, TX	1,614,800	1,614,800
Tifton, GA	1,086,500	1,486,500
Tucson, AZ	882,200	882,200
University Park, PA	795,300	795,300
Urbana, IL	1,541,600	1,741,600
Watkinsville, GA	987,300	987,300
Weslaco, TX	1,329,400	1,329,400
W. Lafayette, IN	1,756,400	1,956,400
Woodward, OK	425,100	425,100
Wooster, OH	865,400	865,400
Wyndmoor, PA	829,600	829,600
Yakima, WA	1,327,400	1,327,400
Headquarters	414,900	414,900
Total	106,196,900	109,896,900

AFRICANIZED BEES

Mr. WHITTEN. Would you please describe in detail the work you are doing in connection with Africanized bees?

Dr. PLOWMAN. ARS research on the Africanized honey bee is conducted as a component of each of the four major honey bee research laboratories. At the Honey Bee Breeding, Genetics, and Physiology Research Laboratory, Baton Rouge, Louisiana, research is conducted on: mating control to permit the production of desirable queens in areas of Africanization in cooperation with other laboratories in the United States, Guatemala, and Mexico; the management of feral populations of Africanized honey bees, particularly in queen breeding areas and recreational lands; and on acquisition and analysis of baseline data related to Africanized honey bee genetics and behavior in temperate areas of Latin America and Europe.

The Honey Bee Research Unit, Welaco, Texas, concentrates on: acquisition of baseline data related to biosystematic and behavioral characteristics of managed and feral honey bee populations in Mexico and Texas; development of techniques for censusing of established feral populations for use when studying population sizes in various habitats; evaluation of the role of Africanized honey bee swarms in the distribution and transmission of bee diseases and parasites; improvement of methods for the rapid and safe destruction of undesirable swarms and evaluation of repellents and other means of personal protection from excessive stinging incidents; and improvement of management technology for beekeepers to maintain desirable bees.

The Carl Hayden Bee Research Center, Tucson, Arizona, focuses on: acquisition of baseline data related to feral honey bee behavior in the arid southwest; the development of bait hives for use in regulatory programs and general management strategies; the development of automated electronic instruments to document the defensive behavior of a honey bee colony for scientific and regulatory purposes; pollination in areas of Africanization; and the maintenance of a closed honey bee population as a source of Africanized honey bee-free germplasm.

The Beneficial Insects Laboratory, Beltsville, Maryland, has responsibility for the development of new technologies for Africanized honey bee identification, including molecular and immunological techniques. This laboratory also provides official USDA Africanized honey bee identification services for regulatory purposes 7 days a week, 24 hours a day.

ADVANCE OF AFRICANIZED BEES

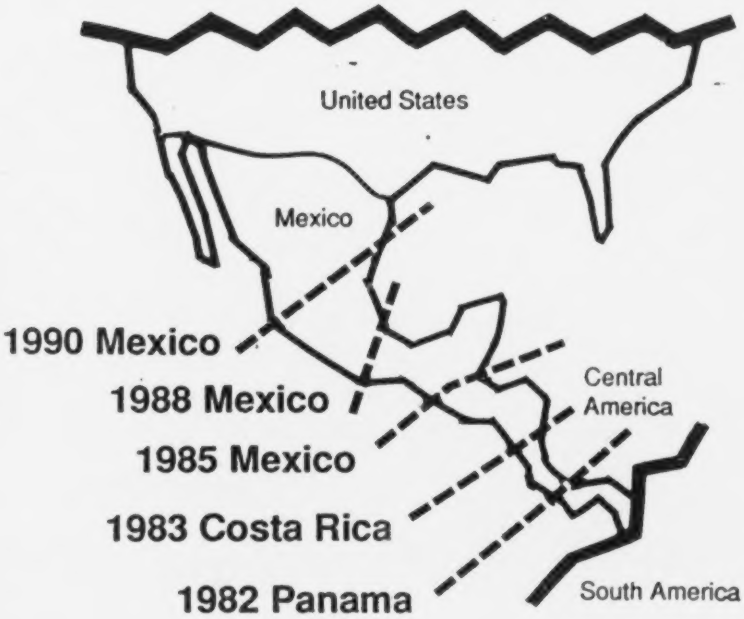
Mr. **Whitten**. Would you please provide for the record a map similar to the one provided last year which shows the advance of the Africanized bee by year?

Dr. **Plowman**. We will provide an update of the map provided during last year's hearings; the map shows Central America and the Southwestern United States and how the bee has advanced by year.

[The information follows:]

Advance of Africanized Bees

Spread of the Africanized Honey Bee



ANTICIPATED PROBLEMS

Mr. **Whitten**. Please describe in some detail what the ARS scientists anticipate will happen when the Africanized bee crosses the U.S./Mexico border.

Dr. **Plowman**. It is anticipated that there will be an increase in serious stinging incidents involving humans and animals from feral swarms of Africanized honey bees. Without regulatory controls, Africanized honey bees can be expected to continue their northward natural dispersal at a rate as high as 250 miles a year.

FUNDING BY LOCATION

Mr. **Whitten**. Please provide for the record the funding assigned to the Africanized bee program by location.

[The information follows:]

Africanized honey bee research by location

Location	*Fiscal year 1990 available*
Tucson, AZ	$219,600
Baton Rouge, LA	829,200
Beltsville, MD	127,100
Weslaco, TX	243,200
Total	1,419,100

RECENT DEVELOPMENTS

Mr. **Whitten**.What developments have occurred in the Africanized bee program during the past 12 months?

Dr. **Plowman**. Two poison bait methods, one drone and one worker delivery system, have been developed to destroy unwanted swarms of Africanized bees. These methods are currently the subject of pilot test evaluation. The methods can also be used as part of a program developed by ARS to produce European honey bee queens in areas saturated with Africanized honey bees. ARS has obtained identification baseline data from collections in Argentina, Brazil, and Mexico indicating that African bees and European honey bees do hybridize and that the drone strategy to mitigate the impact of Africanized honey bees is scientifically sound. Transects have been established for monitoring and obtaining baseline data of managed and feral bees in Northern Mexico and Southern Texas before the arrival of the Africanized honey bees. A mitochondrial DNA method is now available for identifying critical samples of Africanized honey bees and for confirming morphometric identifications.

WESLACO FUNDING

Mr. **Whitten**. In view of the concern about the Afrianized bee, why did the Department of Agriculture delete the funding for the construction of the Weslaco, Texas laboratory?

Dr. **Plowman**. In FY 1990 the Department received $340,000 for the planning and design of a new Bee laboratory at Weslaco, Texas. These funds remain available until expended in the buildings and facilities account and are not required as budget authority in FY 1991. We do not expect to complete the design in sufficient time to award a construction contract in FY 1991. Future funding for this project will be considered in the context of the total ARS program.

ACARINE MITE

Mr. Whitten. Please describe for the Committee the work you are doing in connection with the acarine mite.

Dr. Plowman. Improved methods are being developed for using menthol, Amitraz®, and other compounds for the control of the acarine mite. Studies are under way to characterize the role of the mite in the dissemination of other diseases pathogenic to honey bees. Scientists are developing more reliable sampling methods to insure that bee colonies are free from mite infestation. Such sampling techniques are also needed to evaluate chemical treatments. ARS is also conducting research on the development of acarine-resistant honey bee stock using the most recent theories and practices in bee breeding.

Mr. Whitten. On page 7g-4 you describe the ARS research program that led to the registration of menthol for control of tracheal mites. How much IR-4 resources were devoted to the registration of menthol for control of tracheal mites?

Dr. Plowman. The IR-4 contribution to the registration of menthol was $60,000. This included funds for support of ARS research and administrative costs for compilation and preparation of data submitted to the Environmental Protection Agency.

Mr. Whitten. You say that it is estimated as much as 50 tons of menthol may be used by beekeepers to treat their colonies. What would be the treatment per colony and what would be the cost?

Dr. Plowman. Exclusive of labor, the cost of menthol for treatment is $2.65 per colony using a 50 g. packaged dose. By bulk purchase of 60 pound quantities, the cost of menthol treatment could be reduced to about $1.20 per colony.

Mr. Whitten. Please provide for the record the funding and staff for acarine mite research for fiscal years 1989, 1990 and 1991.

[The information follows:]

	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated
Funding	$427,300	$442,700	$442,700
SY's	2.3	2.3	2.3

VARROA MITE

Mr. Whitten. Please describe for the Committee the work you are doing in connection with the Varroa Mite.

Dr. Plowman. For the short term, formulations of Amitraz®, fluvalinate, tobacco smoke, and other compounds are being evaluated for the detection and control of *Varroa jacobsoni*. For the long term, a honey bee stock that has demonstrated resistance to the mite in Europe has been imported to the United States for further tests. This bee stock was developed jointly by scientists from ARS and Yugoslavia with support from the USDA Office of International Cooperation and Development. Biosystematic methods are being developed to determine the origin of the mites. A membrance technique is being used for *V. jacobsoni* laboratory rearing and disease transmission research.

Mr. WHITTEN. Please provide for the record the funding and staff for Varroa mite research for fiscal years 1989, 1990 and 1991.

[The information follows:]

	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated
Funding	$507,200	$507,400	$507,400
SY's	1.4	1.4	1.4

MAPLE SYRUP PRODUCERS MANUAL

Mr. WHITTEN. What is the status of the updating of the Maple Syrup Producers Manual, Agricultural Handbook No. 134? You will recall that last year at this time we asked you to update the manual.

Dr. PLOWMAN. Since we no longer conduct research on maple syrup, we arranged with the North American Maple Syrup Council to prepare the text and illustrations for a revision of the Handbook. We understand the Council will provide us the final review draft by October 1990.

OTHER FUNDS AVAILABLE TO ARS

Mr. WHITTEN. In fiscal year 1989 you received $688,432 from the Office of International Cooperation and Development. In fiscal years 1990 and 1991 you estimate you will receive $700,000 each year. How are these funds used?

Dr. PLOWMAN. In fiscal year 1989 these funds were used as follows: freezing and preservation of semen and embryos of swine; economical appraisal of tropical forest biodiversity; Indo-U.S. Science and Technology Initiative, Phase 2; plant and seed materials; DNA technology for diseases in crop plants; nitrogen fixation in fababean.

We expect that obligations for fiscal year 1990 and 1991 will be in these same areas of service-type and research agreements and other high priority research in animals and plants; diseases of plant and animal life; nutrition; DNA method; conferences and symposiums; control of insects; research on honey bees; crop fertilization management; ecology control; postharvest technology; and chemicals.

Mr. WHITTEN. You receive approximately $850,000 a year from the Department of Defense. How are these funds used?

[The information follows:]

These funds were used as follows: (1) Department of Defense, on the effects of contaminated waterways on plants; maintenance of military cemetery, forage and livestock production on arid rangelands;. and anopheles freeborn studies; (2) Corps of Engineers, design expert system for control of weeds in waterways; biological control of aquatic weed, and wetland weeds; evaluation of aquatic herbicide application techniques; bioagent for control of *melaleuca quinquenervis*; evaluation for control of aquatic and wetland weed. (3) Army Natick Laboratories, milk based low fat lactose-modified beverage; control procedures of African Swine disease; and milk based powder for military rations. (4) U.S. Army Medical Research Develpment Command, population genetics in Brazilian mosquitoes. (5) Navy Department-Medical Research Institute, energy expenditure under hyperbaric conditions.

Mr. Whitten. You receive approximately $1,750,000 a year from the Department of Health and Human Services. How are these funds used?

[The information follows:]

Health and Human Services Nutrient content of foods	$62,328
National Institutes of Health: Collaborative studies on diet and the prevention of cancer; mammalian erythrocyte micronucleus test as a measure of invo chromosomal damage; and regulations of protein synthesis by the avian retrovirus leader	1,682,800

The fiscal year 1990 and 1991 estimate of funds to be received is based on funds actually obligated in fiscal years 1988 and 1989.

Mr. Whitten. In fiscal year 1989 you received $2.9 million in miscellaneous reimbursements. Would you please spell this out in greater detail for the record.

[The information follows:]

USDA Federal Funds	Obligations
Agricultural Marketing Service Cotton trash measurement and grading	3,720
Cooperative State Research Service Support of crambe and rapeseed research Diversity Magazine; global genetic resources	244,456
Human Nutrition Information Service Development of computer software for HNIS	95,000
Office of International Cooperation and Development Ecology and control of amblyomma variegatum	70,415
Soil Conservation Service Snotel water supply forecast and instrumentation development; instrumentation and sensitivity	1,501
Subtotal, USDA Agencies	415,092
Other Federal Funds:	
Central Intelligence Agency Crop yield study	596,188
Environmental Protection Agency Support symposium on entomology	10,000
Department of Commerce Support of a workshop for NOAA; spectral databases and knowledge bases; space rental	22,056
Department of Interior Research on leafy spurge	10,000
National Aeronautics and Space Administration Apply SIR-C synthetic aperture radar to hydrology; water energy balance in semiarid rangeland monsoon seasons; support of the PBMR flights; nitrous oxide emissions from managed grasses; sexual behavior and pheromones of paper wasps; miscellaneous services at Beltsville, Maryland	40,830
Subtotal, Other Federal Funds	679,074
Non-Federal Sources:	
American Society of Biochemical and Molecular Biology (ASBMB); ARS participation in ASBMB	1,010
American Soybean Association Research Foundation Genetic and agronomic evaluation of soybean; molecular cloning of metabolic genes in soybeans cost of shipping insects to researchers	6,152

	Obligations
American Sugarcane League Sugarcane variety improvement and weed control; production of true sugarcane seed; travel services to observe special problem and to workshop;	21,100
Artichoke Research Foundation Artichoke breeding and insect studies	9,010
Arizona, University Efficiency of production modeling in small farms systems	30,020
Association of Operative Miller pesticide susceptibility to flour beetles and mill indust;	9,884
Binational Agricultural Research and Development Fund—U.S./Israel (BARD) Systems for resource conservation and crop growth; incompatible crops production/cross pollination	53,370
Biotechnology Research and Development Space use at Northern Regional Research Center (NRRC)	8,500
Brigham and Women's Hospital Nutrition biochemistry markers of cancer/ infraction	7,175
California Association Resources Conservation District Immunodiagnostic assay in the aquatic environment	15,950
California Department of Food and Agriculture Exotic plan pathogens for control of California weeds; environmental effectors dormancy germinability hydrilla; control spurge, yellow starthistle and knapweed; detection methods for imported fireants; radiation doses on dispersal of Caribbean fruit fly; traps to monitor Caribbean fruit fly	89,017
California Raisin Advisory Board Heat treatments in insect disinfestation of raisins; early maturing raisin varieties/ mechanical harvest	4,274
California, State of Disinfestation of dried fruits and nuts	22,725
Cotton Foundation Chemicals/aberrations for control systems; services for shipping insects to researchers; and boll weevil rearing for industry research units	101,654

	Obligations
Cotton, Incorporated Increase yield, lint quality, and production efficiency; regeneration of cultivars of cotton; improve harvest and ginning systems for cotton	65,396
Environmental Science and Engineer National dry deposition network monitoring station	4,402
Florida Department of Agriculture Building maintenance, trash removal, and space rental and storage	13,200
Florida Department of Health and Rehabilitation Assess Florida mosquito attraction and surveillance program; larval control strategy for sand flies	46,131
Florida Department of Natural Resources Evaluate biocontrol of mycelial in Australia; biocontrol agents for hydrilla and waterhyacinth	10,065
Georgia, University of Space rental costs	145,200
Kentucky, University of Chemical communication as a buffer against environmental noise	4,772
Maryland University Farm nutrient management fertility recommendations and space rental	60,304
Merck and Company Immunosuppression of calfhood vaccination	3,685
Mississippi State University Computer operational costs	7,885
Mombay Corporation Comparison and bioequivalence/ bovine anthelmintics	3,289
National Cotton Seed Products Association Aflatoxin research and travel expenses for on site investigations; services for purchase of research supplies and oil bearing seeds	10,000
North Carolina, State of Pathogenic collection of peronospora tabacina	18,100
North Dakota State University Support for grass breeder	33,821

	Obligations
North Atlantic Treaty Organization (NATO) Nitrogen fixation in azotobacter and vinelandii	5,542
Oklahoma State Department of Agriculture Space rental charges	696
Oregon, State of Distribution and severity/ergot and blind seed/forage	2,000
Oregon Cranberry Community Virus elimination in rubus clones	3,135
Pacific Northwest Grain Council Crop survey of Pacific Northwest	5,441
Panache Water Drain Drain flow on west side of San Joaquin Valley	50,587
Quarters and Subsistence Services only	89,652
Sale of property Vehicles, animals, seeds, pecans, personal property; purchase of animals to be used in research	479,536
Smithsonian Greenhouse rental space	4,061
Texas A&M University Guayule management to improve plant establishment, solarization to optimize production of small fruits; feeding deterrents for heliothis species in cotton; breeding increase of sorghum	68,292
U.S. Wheat Association Incorporated Survey of samples--cargo	29,787
Utah, State of Mechanisms of plants veered replication/veered host	66,283
Virginia Polytechnic Institute Genetic and biocontrol analysis of nifen genes	39,590
Subtotal, Non-Federal	1,650,693
Discrepancies in the financial system:	
Dairy management research	66,182
Midwest Area	1,703
Research animal services	
Beltsville Area	135,796
Subtotal, Discrepancies	203,681
Total, Miscellaneous Reimbursements	2,948,540

MISCELLANEOUS CONTRIBUTED FUNDS

Mr. **Whitten**. In fiscal year 1989 you received approximately $6 million in miscellaneous contributed funds. What was the source of these funds?

Dr. **Plowman**. The source of the $6 million in miscellaneous contributed funds for fiscal year 1989 will be provided for the record.

[The information follows:]

Miscellaneous Contributed Non-Federal Funds:

	Obligations
Almond Control Board of California Development of rootstock resistance to lesion and nematodes	15,309
American Cocoa Research Institute Disease-free cocoa plants, resistance to disease and insects	30,939
American Cyanamid Evaluation of formulations for dairy cattle fly control	12,409
American Florists Endowment Physiology of growth and flowering of new florist crops	24,672
American Orchid Society Mosaic virus infection in orchids	8,730
American Soybean Association Research Foundation Genetic and agronomic evaluation of soybean, and molecular cloning of metabolic genes in soybeans	6,905
American Sugarcane League Sugarcane improvement weed control and production of true sugarcane seed	47,954
Anheuser-Busch Company Biochemical regulation of carbohydrate in cereal grain	8,250
Beatrice/Hunt Wesson Evaluation of quality of peanut	454
Bradshaw Praeger and Company Whiting susceptibility on apple fruit	5,999
California Beet Growers Biology of sugarbeet diseases--new techniques	989
California Raisin Advisory Board Heat treatments/insect disinfestation of raisins	13,037
California Rice Research Board Quality deterioration in stored paddy rice	856
California, State of Suppress white ringed beetle in California	17,029
California Table Grape Commission Improved fumigation practices for table grapes	22,470

	Obligations
California Tree Fruit and Fresh Peach Advisory Board .... Resistance of stone fruit cultivars to moth attack, and postharvest control of coddling mot in nectarines	20,715
California Wheat .... Market development for Chinese-style food products	2,284
Central Washington Nursery Improvement .... Phytophora stem and root rot of apple rootstocks	2,500
CIBA-GEIGY .... Simple system to destroy pesticide wastewater and screening cotton/biocontrol agents--cotton diseases	3,369
Chevron Chemical Company .... Management of P fertilizer/dryland winter wheat	500
Citrus Research Board .... Postharvest control of fuller rose beetle, and citrus fruit EDB fumigation alternatives	13,506
Deere and Company .... Assessment of soil compaction and crop production	1,430
Del Monte Corporation .... Control of leafspot disease	23,594
Diamond V. Mills .... Harvesting and ginning on fine trash contents	16,048
DuPont Chemical .... Herbicide technology for efficient crop production	9,841
Florida Sugar Cane League, Inc. .... Sugarcane variety development program	8,762
Fluid Fertilizer Foundation, Inc. .... Soybeans grown under a subirrigation/drainage system	1,804
AO-International Board for Plant Genetic Resources .... Provide link between International Board and plant network	24,092
Georgia, University of .... Breeding and see increase of sorghum and of soybean	5,101
Hawaiian Sugar Planters Association .... Diversity in world sugarcane collection and grasses	20,000

	Obligations
Hoechst Roussel Weed control in grasses grown for seed	200
Horticultural Research Institute Interaction of agrochemicals applied on nursery crops.	1,223
Imperial Valley Conservation Research Center Management of cotton plants and their insect pests	2,482
Iowa State University Purchase, import and quarantine certain Chinese swine	250,000
Illinois, University of Purchase, import, and quarantine and release Chinese swine	469,136
Jacques Seed Company Breeding and seed increase of corn during winter nursery	7,843
Lee County, Florida Biological control of melaleuca in Florida heartlands	1,450
Mississippi State, Mississippi Operational cost of computers	13,750
National Livestock and Meat Board Enhancing beef tenderness through endogenous proteases	13,974
National Peanut Council Compare quality of U.S. and foreign origin peanuts	5,000
North American Chemical Company Need to edit source numbers for North American Chemical Companies	2,177
Oregon Cranberry Commission Virus elimination in cranberry clones	6,000
Oregon Strawberry Commission Development of improved method for strawberry virus	8,000
Pioneer Hybrid International Evaluation of Latin American maize germplasm colle, and probiot IC treated neonate calves/cryptosporidium	60,894

	Obligations
Proctor and Gamble Company CACO-2 cell line, nutrient bioavailability and interactions	2,335
Prune Board of California Heat treatment for insects of dried fruits and nuts	819
Union Carbide Pink bollworm population dynamics	400
Rio Grande Valley Sugar Growers, Inc. Pheromones to control rice borers	2,984
South Florida Water Management District Integrate pest control land ground water models; Biological control of melaleuca in Florida wetlands	20,836
Texas A&M Experiment Station Breeding and increase of sorgum	3,400
Valmont Industries Computer control and irrigation systems	4,093
Vermont, University of Weed control in reduced tillage cropping systems	2,034
Walnut Marketing Board (California) Efficacy of heat treatments for inserts of walnuts	11,077
Washington Red Raspberry Commission Development of improved citrus-free red raspberry	6,625
Washington Strawberry Commission Development of virus-tested strawberry cultivars	1,000
Washington Tree Fruit Research Commission Apple decline; waxing of fruit with artificial and natural storage; market quality and storage life of anjou pears; detect erwinia amylovora in internal apple tissues	177,041
Wesmin Resource Conservation and Development Association AGNPS model component testing and validation	4,160
Woodward and Dickerson Mode of action of DCPTA bioregulators	46,702
W.R. Grace and Company Biocontrol of damping-off of bedding plants	17,929

	Obligations
Competitive Grants Awarded in FY 1989 and prior years	529,804
Other Miscellaneous Contributed Non-Federal Unobligated balances from prior year contributions	3,203,042
Subtotal, Miscellaneous Contributed Funds	5,245,958
Technology Transfer, Licensing Receipts	2,000
Technology Transfer:	
Abbott Laboratory Biocontrol of Colorado potato beetle, Russian wheat aphid infestation and leaf rolling	29,978
Agracetus (Mississippi State) Cotton strains with gene bacillus thuringiensis	12,320
American Cyanamid Develop certain technology related insect amidating enzyme	5,250
Amegen (Ames, Iowa (NADC) Granulocyte--colony stimulating factor effects	1,500
Biotechnology Research and Development Novel cutinases produced by plant-association bacteri; phytoalexin elicitation, production and purification; fungal plasmid biochemistry and biotechnology; biocontrol of insects: entomogenous fungi, application of luminescence sensors to F. control developments of shuttle and expression vectors for anaerobes; novel sensors to monitor solid, substrate fermentation; stable transformation of monocotyledonous	372,340
Campbell Institute The mechanism of mobility of (ALV) inserts	16,295
Campbell Soup Company Improve tomato flavor in tomato base products	25,000
CIBA-GEIGY Artificial diets for trichogramma spp.	17,598
Codon (Kerrville, Texas) Recombinant submit vaccine for protection of cattle	27,280
Coors Biotech Colonization of chicken intestines	14,501

	Obligations
Embrex Vaccine of chicken embryos for protection against avian coccid	4,863
Hoffman Loroche Evaluation of renotec 100 and Ronotec 201 emulsion/crop plants	12,476
IGB Products,Ltd. Production of insect viruses in bioreactors	18,036
McLaughlin Gormely King Company Evaluate and assess pesticide chemicals for disinfestation	18,589
Monsanto Industrial and Chemical Study DNA sequence of native and foreign maize; biological control of downy brome; strains and strain combinations of root colonizing bacteri; and monitor rate of genetic engineering of microorganisms in soil	37,244
Maag Agricultural Chemical Biology and control of the pharaoh ant	5,840
Nabisco Brand Incorporated Production methods to cookie texture, and studies on seed deterioration	48,401
Nova Laboratories Exogenous cellulase of forage fiber digestion in dairy cows	1,206
Pacific Scientific Development of a stable biological standards/NIRS	1,723
Proxis Biologics Vaccine for reduction of salmonellae in poultry	26,259
Select Laboratories Interaction of sertoype 1/2 vaccines for marek disease	7,809
Southeastern Poultry and Egg Colinazation factors; campylobacter jejuni in chickens	23,257
Upjohn Cuticule genes of haemonchus contortus	33,000
W.R. Grace and Company Control of plant pests and pathogens/neem seed	700
Subtotal, Technology Transfer	761,465
Total, Miscellaneous Contributed Funds	6,009,423

OBJECT CLASSIFICATION TABLE

Mr. WHITTEN. In the Other Services account you are showing this account will increase from $123 million in 1989 and 1990 to $139 million in 1991. What is the reason for this $16 million increase?

Dr. PLOWMAN. The estimated increase of $16 million in this object classification is for research and service requirements that are purchased through contracts, cooperative agreements and other extramural arrangements. Most of the increase reflected in this classification results from the recommended program expansions budgeted in FY 1991 including groundwater quality, global climate, germplasm, food safety and animal science research initiatives. The plant genome and narcotic research proposals are presented totally in this category. The inflationary cost of doing business of ongoing programs is also reflected in this category.

Mr. WHITTEN. Would you please provide for the record a sub-object class breakdown for the Other Services account?

[The information follows:]

The sub-object class breakdown for Other Services for fiscal year 1990 are as follows:

Contractual Services performed by other Federal agencies	$3,215,000
National Finance Center	4,515,000
Repair, alteration or maintenance of facilities	20,138,000
Repair, alteration or maintenance equipment	5,908,000
Repair, alteration or maintenance of space (interior)	7,232,000
Repair, alteration or maintenance of structures (exterior)	9,645,000
Repair of office equipment	1,154,000
Contractual services-other	22,928,000
Research contracts	1,805,000
Architecture and engineering contracts	2,555,000
Research support	30,228,000
Agreements-other	2,895,000
Specific cooperative agreements	13,628,000
General cooperative agreements	7,995,000
All other	5,766,000
Total, other services	139,607,000

BILL LANGUAGE

Mr. WHITTEN. You are proposing to delete the language involving the purchase of land at Corvallis, Oregon; Weslaco, Texas; and Kimberly, Idaho. Would you please describe for the Committee the status of the land purchases in each of these three locations, including the cost if the land was purchased?

Dr. PLOWMAN. At Weslaco, Texas, we are seeking to acquire 12.46 acres of land at a cost of approximately $5,800. The acquisition should be completed by June 30, 1990.

In addition, we are seeking to acquire 40 acres of land at Corvallis, Oregon. The 40-acre site is currently being appraised to determine the property's fair market value which will form the basis for the offer to be made to the landowner. We anticipate a July 31, 1990, date for completing this transaction.

At Kimberly, Idaho, we are hoping to acquire approximately 80 acres of land. We anticipate completing the acquisition by August 31, 1990.

FUNDING VERSUS STAFF

Mr. **Whitten**. For fiscal year 1991 you are requesting an increase of approximately $38 million for salaries and expenses funds over fiscal year 1990. However, you are not requesting or proposing any increase in your staff. Specifically, how will these funds be used if none of the funds are to go for the cost of additional personnel?

Dr. **Plowman**. The increased resources will be used to support the research program expansions addressed in the President's Budget: Groundwater contamination, animal health, global climate change, plant and animal germplasm and food quality and safety. These funds will be used in support of these initiatives to meet the cost of equipment, materials, contractual and cooperative agreements, travel, etc. Additional scientists, research associates and technical support personnel will be hired or transferred into these priority areas to pursue these research initiatives within the target personnel ceiling. The agency will use grants and cooperative agreements in all of these initiatives to complement its in-house research effort. The Plant Genome initiative is predominantly a grant program. A portion of the proposed increase, $5.4 million, is for pay raises anticipated in FY 1991.

NITROGEN FIXATION

Mr. **Whitten**. On page 7-17 of the notes you state that, "The international collection of nitrogen-fixing rhizobium bacteria will be supported." Why do you use this choice of words? Has it not been supported in the past?

Dr. **Plowman**. The international collection of nitrogen-fixing bacteria has been and continues to be supported in a joint funding effort between The Agency for International Development-ARS and USAID. AID will complete funding support through FY 1991. The increased interest in plant-microbe nitrogen-fixing organisms specifies that the collection must be enlarged, enhanced, and characterized to support an important research area.

Mr. **Whitten**. Where is this collection located?

Dr. **Plowman**. The rhizobium collection is located at the Beltsville Agricultural Research Center, Beltsville, Maryland.

PLANT GENOME MAPPING

Mr. **Whitten**. On page 7-17 of the notes you state that, "Other nations are aggressively pursuing plant genome mapping efforts at this time and threaten U.S. leadership." What are some of the other countries that are aggressively pursuing genome mapping?

Dr. **Plowman**. The countries that are aggressively pursuing plant genome mapping are Japan, Holland, Germany, United Kingdom, France, Canada, and Australia.

Mr. **Whitten**. On page 7-18 of the notes you state, "A major national information networking system will be developed and maintained to support the plant gene mapping generated knowledge base." If you plan to share the knowledge with the rest of the world, why were you concerned on the page before in protecting the U.S. lead?

Dr. **Plowman**. A national database information network is necessary to reduce duplication of research efforts and to track research results. The database access will not hinder our research leadership and advancements in the research laboratories of U.S. investigators. They will have the research results to effect patent/intellectual property rights of their discoveries. The database information is necessary to ascertain the uniqueness of their findings. This would reduce the risk of foreign nations restricting U.S. scientists access to the technology.

NARCOTIC PLANTS

Mr. WHITTEN. For fiscal year 1991 you are requesting $6.5 million for research to control narcotic plants, an increase of $5 million above the amount available for fiscal year 1990. Where will this research be carried out?

Dr. PLOWMAN. The ARS research program on control of illicit narcotic crops is centered at the Beltsville Agricultural Research Center, with projects at other locations as appropriate.

Mr. WHITTEN. Have you been receiving funds in the past for this type of research from other agencies on a reimbursable basis?

Dr. PLOWMAN. We have received limited funds from the Department of State and the Central Intelligence Agency.

Mr. WHITTEN. Last year, Congress passed a Drug Bill. Were any funds transferred to you from other agencies under this bill?

Dr. PLOWMAN. None of the funds we have been receiving from other agencies were included in last year's Drug Bill.

CONTINGENCY FUND

Mr. WHITTEN. The Contingency Fund was established by Congress in fiscal year 1962. Would you please include for the record a copy of the legislation establishing this fund?

[The information follows:]

The direction given by Congress to establish the Contingency Fund was in House Report Number 87-448, FY 1962, and directs the Agency as follows:

CONTINGENCY RESEARCH FUND

"To meet the needs of Agriculture, the Department must be in a position to take effective research action at once when a serious problem arises. It should have a source of funds from which to draw immediately, without having to negotiate a transfer of funds from other work.

"For instance, the spotted alfalfa aphid invaded the Southwest in 1954 and spread throughout the Western States in the next 2 or 3 years. The Department shifted about $40,000 from other work to develop chemical controls, look for parasites and predators, and develop resistant varieties. An adequate contingency fund would have enabled the scientists to save at least a year in the period required for eradication—at a time when the spotted alfalfa aphid was costing growers $30 to $40 million annually.

"Another invader has been the face fly, which came into New England from Canada some years ago. Suddenly, in 1959, it threatened to become a serious menace to our livestock. Again, the emergency was met by shifting $30,000 to $40,000 from other programs. This worrisome pest has now spread across the country as far west as Nebraska. Department entomologists feel that they lost valuable time in bringing this threat under control due to the lack of a contingency fund from which to draw.

"To enable the Department to move in on such problems quickly, the Committee has established for the first time a contingency research fund of $1,000,000 for fiscal year 1962. The fund will be available to the Administrator of the Agricultural Research Service to expedite work on research problems and to meet special research needs as they arise.

"Such a fund will also be available to give increased emphasis to some of the many special problems presented to the Committee by Members of Congress and other witnesses this year, including basic research on wheat and grains, research on the improved digestability of dry edible beans, barley and malt research, research on pear decline, forage and range research, soybean research, poultry research—particularly with reference to airsacculitis—and water conservation research, and others. In many of these areas, the work might be done through contracts with qualified research institutions."

BATON ROUGE

Mr. WHITTEN. During 1989 you used $15,000 to rebuild and replenish beehives lost during a storm at Baton Rouge, Louisiana. How many hives were replaced and how many were rebuilt?

Dr. PLOWMAN. There were 75 hives replaced and 150 hives rebuilt.

WYNDMOOR, PENNSYLVANIA

Mr. WHITTEN. You used $267,000 to repair damage caused by vandalism, fire and smoke at Wyndmoor, Pennsylvania. Please describe what happened at that laboratory.

Dr. PLOWMAN. The Eastern Regional Research Center was broken into at 3:45 AM February 23, 1989. Several offices were vandalized and a fire was started in one of the laboratories. Severe fire and water damage to the laboratory required $267,000 in renovations. The perpetrator was apprehended within a few days of the incident and has since pleaded guilty to arson and destruction of Government property.

WESLACO, TEXAS

Mr. WHITTEN. You used $10,000 to replace stolen office equipment at Weslaco, Texas and $78,000 to purchase security equipment. Was the security equipment purchased as a result of the stolen office equipment?

Dr. PLOWMAN. The theft of office equipment on the weekend of March 4-5, 1989, prompted us to purchase security equipment for the Weslaco location. This single instance of theft was not the sole reason for the security system; rather, it was the latest and most costly of a series of thefts from the premises.

ST. CROIX

Mr. WHITTEN. You used approximately $311,000 for repairs and replacement of facilities in St. Croix as a result of Hurricane Hugo. Please describe the facilities that were replaced.

Dr. PLOWMAN. The funds used at St. Croix were for the following items: replacement of 4700 linear feet of chain link fence; repair of approximately 2600 linear feet of chain link fence; repair of 4400 sq. ft. of office-lab space requiring replacement of roof, ceiling, walls, and utilities; repair of 2300 sq. ft. of Government residence space with damages similar to those at office-lab space; installation of emergency generators to power the residence, offices, and labs; and replacement of metal cover over 54′ × 54′ × 6′ concrete cistern.

NORTH CAROLINA

Mr. **WHITTEN**. Were any contingency funds used as a result of damage from Hurricane Hugo in North Carolina?

Dr. **PLOWMAN**. No, no damage was done at the ARS location in North Carolina.

LOCATION INCREASES

PHOENIX, ARIZONA

Mr. **WHITTEN**. Under your plan, Phoenix, Arizona would receive an increase of approximately $800,000. For what would these additional funds be used?

Dr. **PLOWMAN**. The additional funds will be used primarily to accelerate research on the effects of increasing concentrations of carbon dioxide in the atmosphere on plant growth, crop yields, and the control of insects, weeds, and diseases. Some of the added funds will be used to develop crop production systems that minimize the movement of agricultural chemicals to groundwater under irrigated lands of the Southwest.

GAINESVILLE, FLORIDA

Mr. **WHITTEN**. Gainesville, Florida would receive an increase of approximately $1 million. For what would these funds be used?

Dr. **PLOWMAN**. The recommended budget increase of approximately $1 million for our Gainesville, Florida, location will be applied to the broad objectives of enhancing environmental quality through agricultural practices and enhancing food quality and safety for the consumer. New research thrusts will include investigations to determine factors affecting methane and nitrous oxide evolution from paddy rice and research to develop improved soybean germ-plasm resistant root knot nematodes in order to reduce chemical inputs for soybean production. In addition, research will be conducted to develop insect gene vector systems for separating male and female fruit flies in order to facilitate leading to their eradication, as well as research on modeling and simulation of arthropod-borne disease transmission.

ATHENS, GEORGIA

Mr. **WHITTEN**. Athens, Georgia would receive an increase of $1.3 million. How would these funds be used?

Dr. **PLOWMAN**. The increase funds of $1.3 million at Athens, Georgia, to enhance food safety would be used as follows: To decrease microbial contamination during poultry processing by determining more precisely where cross-contamination with Salmonella may occur; To determine the mode of transmission of Salmonella enteritides into eggs and delineate the immune response of hens; To delineate methods to quickly and precisely determine the temperature to which meat has been cooked to help assure that hazardous microorganisms are not present; and, To determine the toxicity to animals of fumonisins, toxins made by a common mold found in corn, and identify the environmental factors leading to their occurrence.

TIFTON, GEORGIA

Mr. WHITTEN. Tifton, Georgia would receive an increase of approximately $900,000. How would these additional funds be used?

Dr. PLOWMAN. The added funds will be used to develop economically viable crop production systems for minimizing the movement of agricultural chemicals to ground water; document the sources of agricultural contaminants underlying the more intensively farmed areas of the Southeast, and support the modeling of nitrogen cycles for selected agricultural ecosystems at a scale appropriate for inclusion in global circulation models.

AMES, IOWA

Mr. WHITTEN. Ames, Iowa would receive an increase of approximately $1.3 million. How would these additional funds be used?

[The information follows:]

Controlling corn pests by increasing host resistance	$270,000
Reducing contamination in animal production	405,000
Enhancing animal health	630,000
	1,305,000

BELTSVILLE, MARYLAND

Mr. WHITTEN. Beltsville, Maryland would receive an increase of $4 million. What are your plans for these additional funds?

[The information follows:]

The proposed increase for the Beltsville Agricultural Research Center would be used to expand or initiate research in the following areas:

Natural Resources and Plant Research—$2,350,000.
  Enhance environmental quality—$750,000.
  Development of crops that adapt to changing climate, insect, and disease conditions—$750,000.
  Identification of plant germplasm with reduced susceptibility to disease—$300,000.
  Develop systems to minimize chemical inputs—$200,000.
  Introduction and maintenance of plant germplasm—$350,000.
Commodity Conversion and Delivery—$1,050,000.
  Enhance quality and safety of animal products for the consumer—$400,000.
  Develop diagnostic test for rapid detection of cysticercosis in cattle—$250,000.
  Molecular approaches to control insects and diseases in plants—$400,000.
Animal Germplasm—$1,075,000.
  Identification of specific genes responsible for growth, parasite and disease control, and reproduction—$675,000.
  Develop practical methods for the separation of male and female gametes and develop techniques for cryopreservation of embryos and stem cells—$400,000.

CLAY CENTER, NEBRASKA

Mr. WHITTEN. Clay Center, Nebraska would receive an increase of approximately $1.4 million. How would these additional funds be used?

[The information follows:]

The proposed increase of $1,575,800 for the Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska, would be used to expand or initiate research in the following areas:

Enhance food quality and safety for consumers through improved methods to identify Salmonella and other microbes that can contaminate animal products and identification of the epidemiology in the live animal of selected animal diseases that can affect animal products at the time of consumption—$950,000.

Mapping the animal genome and germplasm conservation. Develop genetic maps for cattle and swine and identify genes or gene complexes related to production traits and resistance to disease—$625,000.

ITHACA, NEW YORK

Mr. Whitten. Ithaca, New York would receive an increase of approximately $600,000. How would these funds be used?

Dr. Plowman. The proposed increase will be used for research in our Plant Protection Research unit at Ithaca which curates over 2,000 kinds of insect fungal pathogens. This will be expanded to include insect viruses and plant nematode pathogens, $400,000. We no longer have adequate chemical control measures for plant nematodes. The nematode research at Ithaca will expand to develop alternative control measures, $200,000. The $600,000 increase will allow ARS to undertake this important research.

GRAMM-RUDMAN SEQUESTRATION

Mr. Whitten. How did you apply the Gramm-Rudman Sequestration $8,193,000 reduction to your individual research programs and your individual laboratories? You might describe how you did this generally. We do not need to know the reduction applied to each facility. Were there any situations at USDA-ARS facilities where sequestration caused a major problem?

Dr. Plowman. The Gramm-Rudman Sequestration of $8,193,000 was taken, as Congress instructed, by program, project and activity. We have taken the cut across the board, all programs and lines of research at all locations were reduced by applying 1.4% to the base dollars at that location. The sequestration itself did not cause any major problem in any of our locations. However, we are concerned about the serious impact of the cumulative absorption of the sequestration and other recent absorptions of pay costs and general reductions.

NATIVE U.S PLANTS

Mr. Whitten. On page 7g-4 you state that 99 percent of U.S. crop acreage being planted to crops is being planted to crops not native to this country. What crops grown in the United States are native to the U.S.?

Dr. Plowman. Crops that are native to the U.S. are sunflower, blueberry, cranberry, pecan, Jerusalem artichoke, and tobacco.

Mr. Whitten. On page 7g-5 you discuss Beta III, which is 3-5 times richer than most other carrots in beta carotene. Do you see a major market for Beta III being in developing countries and if so, why?

Dr. Plowman. Based on the favorable reports received from the 16 developing countries that have received free seed samples, we believe there is the potential for a major market for Beta III in these and other countries. We believe this not only because this variety has excellent flavor, yield, and other commercial characteristics, but also because of the beta carotene content which is a precursor to vitamin A. Many people in developing countries have a deficiency in vitamin A.

NEW ORANGE VARIETY

Mr. **Whitten**. You state that the new orange variety Ambersweet has been test grown in two areas of Florida since 1974 and should be available for commercial nurseries in 1990. Is it normal to take 16 years to test a variety?

Dr. **Plowman**. While we did begin testing a few trees of Ambersweet variety in 1974, we did not begin large-scale testing until a later date. It normally takes about 10 years to adequately test a potentially new citrus variety.

GUARDING DOG PROGRAM

Mr. **Whitten**. On page 7g-7 you discuss the guarding dog program. How much has ARS devoted to the guarding dog program during the last ten years, by year?

Dr. **Plowman**. The guarding dog program was part of a larger project on alternative ways to protect sheep from predators. The funding ARS devoted to the guarding dog program was about $70,000 for 1979 and 1980; $90,000 in 1981; $50,000 for 1982 and 1983; $65,000 in 1984; $85,000 in 1985; and $90,000 for 1986 and 1987. The project was completed and terminated in 1988, at which time the Guard Dog Program was transferred to Animal Damage Control, Animal and Plant Health Inspection Service.

Mr. **Whitten**. What types of dogs have been recommended by the staff at Dubois, Idaho?

Dr. **Plowman**. Research has demonstrated the Great Pyrenees, Akbash, and Anatolians are the best dogs for guarding sheep and goats.

Mr. **Whitten**. There have been a number of reports in the press recently, about using donkeys to guard sheep. Has this been looked at by the staff at Dubois?

Dr. **Plowman**. Research has not been conducted on donkeys at Dubois to evaluate their use for guarding sheep. The Animal Damage Control Unit in APHIS, worked with local ranchers on the use of guard donkeys.

Mr. **Whitten**. Since dogs have been used to guard sheep for several thousand years, what is unique about the contribution of the scientists at Dubois, Idaho?

Dr. **Plowman**. Research on the use of dogs to guard sheep had never been conducted under U.S. sheep production systems. ARS scientist selected three breeds of dogs to determine their usefulness under herd range and pasture management grazing situations.

SCREWWORM PROGRAM

Mr. **Whitten**. On page 7g-8 you discuss the new gel diet that ARS scientists have developed in connection with the screwworm program and state that this gel diet will help to conserve APHIS resources. How much will be saved as a result of this diet and why?

Dr. **Plowman**. When the new gel diet is fully incorporated into the screwworm production system, there will be a 40 percent reduction in diet material, resulting in a savings of $450,000 per year at a production level of 100 million flies per week. It will also be possible to reduce the labor force by 440 workers for a savings of approximately $2,574,000 per year. Other benefits derived from the gel diet will include: easier maintenance; improved sanitation in the production plant with less ammonia; larvae of more uniform size and better quality; and recycling waste media with less environmental impact. It is still too early to determine the monetary value of these other benefits.

SATELLITE IMAGERY FOR CROP INVENTORIES

Mr. WHITTEN. On page 7g-15 you discuss the work underway at Weslaco using SPOT, French Satellite System for Observation of the Earth. Why are you using the French satellite as opposed to LANDSAT?

Dr. PLOWMAN. The SPOT satellite has better spatial resolution and greater frequency of observations for detecting delinquent cotton. The destruction of delinquent cotton stalks in the Rio Grande Valley, which is mandated by State legislation, is an essential component of a program to protect cotton farmers from crop losses associated with boll weevil infestations.

Mr. WHITTEN. How old is the data you are using?

Dr. PLOWMAN. Generally there is a time interval of a few weeks between the time the satellite acquires the data and the time that the data is processed by the scientist. This time delay is not excessive for most projects. Under some circumstances, this time interval can be reduced to a week.

Mr. WHITTEN. How does your program relate to the program carried out by FAS or whoever currently is responsible for the satellite imagery work at USDA?

Dr. PLOWMAN. Much of the research in ARS on the interpretation of satellite imagery is undertaken at the request of or in support of agencies such as FAS and SCS. The primary thrust of the ARS program is directed toward the development of improved procedures for assessing crop condition, detecting and quantifying crop stresses, and predicting crop yield. The equipment used in ARS research is similar to or fully compatible with the equipment being used in the programs of other USDA agencies.

ACID RAIN

Mr. WHITTEN. Please describe for the Committee the work you are doing in connection with research on acid rain.

Dr. PLOWMAN. Acid rain research is conducted cooperatively with the Environmental Protection Agency and the U.S. Forest Service, as well as the CSRS Special Grants Program. The crops field research program was completed in 1987. Since then research has been focused on filling specific gaps in our fundamental knowledge necessary to predict the effects of acid rain under environmental conditions that may occur in the future. Specific research includes the effects of rain acidity on bacterial population densities in the root zone, on plant parasitic nematodes, and on loblolly pine trees. As these research projects are completed, research will be shifted to determine the combined effects of acid rain and ozone in an environment with elevated levels of ultraviolet radiation and atmospheric carbon dioxide concentration.

Mr. WHITTEN. Please provide for the record the funding and staff for acid rain research for fiscal years 1989, 1990, and 1991, by location.

Dr. PLOWMAN. Our research unit at Raleigh, North Carolina, conducts the only ARS research program to determine the acidic precipitation effects on crops and crop production.

[The information follows:]

Location	Fiscal year 1989 available	(SY)	Fiscal year 1990 available	(SY)	Fiscal year 1991 estimated	(SY)
Raleigh, NC	$379,000	2.5	$371,800	2.5	$371,800	2.5

BLUEBERRY/CRANBERRY RESEARCH

Mr. WHITTEN. Please describe for the Committee the work you are doing in connection with blueberries and cranberries, by location.

Dr. PLOWMAN. A description of blueberry and cranberry research will be provided for the record.

[The information follows:]

Location	Description of blueberry research
Booneville, AR	Evaluation of existing varieties for adaptation to South-Central production areas; cultural studies.
Orlando, FL	Quarantine and postharvest disease control relating to exports.
Beltsville, MD	Germplasm evaluation; variety development; root adaptation to upland pH-neutral soils; bud dormancy, in vitro culture of endomycorrhyzae.
Poplarville, MS	Breeding, field testing, and introduction of new varieties adapted to Gulf States; cultural studies; disease control.
Chatsworth, NJ	Genetics and breeding of new improved varieties; pest control.
Lane, OK	Postharvest practices to reduce disease losses and increase marketability.
Kearneysville, WV	Weed control; biocontrol of disease pests; variety development.
	Description of cranberry research
Chatsworth, NJ	Biocontrol of diseases; epidemiology of diseases.
Yakima, WA	Insect pheromones; nonpesticide insect control measures.
Kearneysville, WV	Biological control of postharvest pests; weed control.

Mr. WHITTEN. By location, what is the funding and staff for blueberry/cranberry research for fiscal years 1989, 1990, and 1991?

[The information follows:]

ARS funding and staff years for blueberry/cranberry research by location and fiscal year is as follows:

BLUEBERRY/CRANBERRY RESEARCH

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Booneville, AR	$96,300	.5	$94,500	.5	$94,500	.5
Orlando, FL	37,900	.2	37,200	.2	37,200	.2
Beltsville, MD	585,900	2.9	588,200	2.9	588,200	2.9
Poplarville, MS	247,500	1.2	292,200	1.5	292,200	1.5
Chatsworth, NJ	633,000	3.2	553,000	2.5	553,00	2.5
Lane, OK	61,700	.3	60,600	.3	60,600	.3
Corvallis, OR	59,400	.3	37,100	.2	37,100	.2
Yakima, WA	50,700	.2	49,800	.2	49,800	.2
Kearneysville, WV			173,100	.9	173,100	.9

BLUEBERRY/CRANBERRY RESEARCH—Continued

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Total	1,772,400	8.8	1,885,700	9.2	1,885,700	9.2

RUSSIAN WHEAT APHID

Mr. WHITTEN. Please describe for the record the work you are doing in connection with the Russian wheat aphid, by location.

[The information follows:]

Plant Science Research Laboratory, Stillwater, OK.—This is the center of our activity on Russian wheat aphid (RWA). They are investigating: (1) developing RWA-resistant cool- and warm-season cereal, turf, range, and conservation grass species; barley; and wheat germplasm; (2) releasing parasites and predators, collected from foreign exploration, into RWA-infested grain growing regions; and (3) developing IPM strategies to integrate cultural practices, resistant germplasm and biocontrol agents into a crop protection strategy; and (4) the molecular nature of the physiological and biochemical basis or RWA damage.

Biological Control of Insects Research Laboratory, Columbia, MO.—Here we are conducting genetic studies on RWA parasites to determine the most likely area for establishment in the Great Plains.

Systematic Entomology Laboratory, Beltsville, MD.—This laboratory provides taxonomic identification of parasites and predators being imported into the U.S. for release against RWA.

European Parasite Laboratory, Behoust, France.—This is the center of our foreign exploration. We were successful in developing agreements with both the Soviet Union and China that allowed collection of natural enemies in those countries.

Plant Protection Research Unit, Ithaca, NY.—During explorations, we discovered several species of fungal pathogens to be important control agents. Therefore, we have directed our Ithaca laboratory which is the center of our activity on development of mycoinsecticides, to investigate how these natural enemies might be utilized. The Beneficial Insects Research Laboratory, Newark, DE, provides quarantine support for all importation of parasites and predators.

Mr. WHITTEN. By location, what is the funding and staff for Russian wheat aphid research for fiscal years 1989, 1990 and 1991?

[The information follows:]

RUSSIAN WHEAT APHID RESEARCH

Location	Fiscal year 1989 available	Fiscal year 1990 and 1991 estimated
Headquarters		$111,100
Newark, DE	$33,300	32,700
Manhattan, KS		75,800
Columbia, MO		59,400
Lincoln, NE		10,700
Ithaca, NY	45,300	242,300
Stillwater, OK	444,600	906,800
Brookings, SD	159,200	
Behoust, France	272,300	229,000
Total	954,700	1,667,800

BARLEY YELLOW DWARF VIRUS

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with barley yellow dwarf virus, by location.

[The information follows:]

The ARS barley yellow dwarf virus (BYDV) research program in FY 1990 consists of 3.5 SY funded at $992,900. The ARS plan for BYDV research in FY 1991 is to continue the ongoing research programs at the same funding level as in FY 1990. The goal of this research is to develop and transfer to cereal crop producers technology to prevent or reduce economic losses due to BYDV. This will be achieved by: (1) development of crop germplasm lines and new varieties with improved BYDV infection immunity, resistance, or tolerance, and (2) development of cultural production systems based on BYDV-resistant or tolerant crop varieties and suppression of BYDV insect vector populations.

Albany, CA (1.0 SY $243,500). To date, the Barley Yellow Dwarf Virus (BYDV) research at Albany, CA, has been directed toward developing a general method for transfering genes into monocotyledenous plants. A method was successfully developed by using corn as the model plant. Now ARS will conduct follow up research on barley and other small grains. The objective will be to transfer genes into barley and other small grains that confer a high level of protection against the virus and its insect vectors.

Ithaca, NY (1.0 SY, $195,300). The purpose of this research is to obtain data on the viral pathogen, its structure, reproduction, and movement within the host plant and in insect vectors; develop technologies to detect the virus in plants and in insect vectors; and determine biological variability among strains of the virus.

West Lafayette, IN. and Brookings, SD (0.3 SY, $138,300). The purpose of this research is to determine which insect species spread the various strains of BYDV and to obtain information about the biology of the insects, feeding behavior on plants, and migration habits within fields and over long distances.

Pullman, WA; University Park, PA; and Urbana, IL (2.2 SY, $345,800). The objectives of the research are to evaluate plant germplasm for sources of resistance to the virus and several species of insect vectors that feed on cereal crops, develop improved germplasm and new varieties of cereal crops, and develop disease management strategies based on the biology of the disease under natural conditions.

Mr. **Whitten**. By location, what is the funding and staff for barley yellow dwarf virus research for fiscal years 1989, 1990, and 1991?

[The information follows:]

BARLEY YELLOW DWARF VIRUS

	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Albany, CA	1.0	$247,900	1.0	$243,500	1.0	$243,500
Brookings, SD	.1	59,800	.1	58,700	.1	58,700
Ithaca, NY	1.1	204,200	1.0	195,300	1.0	195,300
Pullman, WA	.1	39,800	.1	39,100	.1	39,100
University Park, PA	.1	39,800	.1	39,100	.1	39,100
Urbana, IL	1.0	272,700	2.0	267,600	2.0	267,600
West Lafayette, IN	.2	72,500	.2	79,600	.2	79,600
Total	3.6	936,700	4.5	922,900	4.5	922,900

BIODEGRADABLE PLASTIC

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with biodegradable plastic, by location.

Dr. **Plowman**. Work is in progress at the ARS' Northern Regional Research Center on two product classes: films and injection-molded articles. A 40 percent starch film has been manufactured, and its properties are excellent. Injection molded articles have been prepared incorporating 60% starch, and test results are encouraging. Strong links are being forged with industry to commercialize the technology.

Mr. WHITTEN. By location, what is the funding and staff for biodegradable plastic research for fiscal years 1989, 1990 and 1991?

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Peoria, IL	$1,494,000	9.8	$1,629,900	10.8	$1,629,900	11.8

BRUCELLOSIS RESEARCH

Mr. WHITTEN. Please describe for the Committee the work you are doing in connection with brucellosis research, by location.

Dr. PLOWMAN. The ARS bovine brucellosis program involves intramural and extramural research aimed at developing improved vaccines and diagnostic procedures and determining mechanisms of resistance to Brucella infection. The National Animal Disease Center in Ames, Iowa, is attempting to develop a diagnostic test that will differentiate between vaccinated and infected animals, as well as developing deletion mutants of strain 19 as potential vaccine candidates. These mutants lack one of the major protein antigens; and, if they provide protection, they would allow differentiation of vaccinated and infected animals. ARS also supports research at Oklahoma State University, Iowa State University, and Texas A&M University.

Oklahoma State University is attempting to develop a subunit vaccine, using *Escherichia coli* as an expression vector. The genes of several Brucella proteins have been cloned and inserted into *E. coli*, and at least one of these genes has successfully expressed Brucella proteins. Oklahoma State University has also developed a sensitive DNA diagnostic probe which detects as few as 500 Brucella cells per gram of tissue.

Iowa State University is attempting to develop a subunit vaccine, using Salmonella as an expression vector.

Texas A&M University is conducting basic research on mechanisms of resistance to *B. abortus* and characterizing surface components which may be useful in the development of synthetic vaccines and diagnostic tests.

Mr. WHITTEN. By location, what is the funding and staff for brucellosis research for fiscal years 1989, 1990 and 1991?

Dr. PLOWMAN. The funding and scientific staff for brucellosis research for fiscal years 1989, 1990 and 1991 will be provided for the record.

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Ames, IA	$2,725,800	11.1	$2,640,800	10.4	$2,640,800	10.4
Texas A&M University	100,000		98,500		98,500	
Oklahoma State University	332,800	3.0	336,200		336,200	
Iowa State University	15,000		34,500		34,500	
Totals	3,173,600	11.1	3,110,000	10.4	3,110,000	10.4

POTATO RESEARCH

Mr. WHITTEN. Please describe for the record the work you are doing in connection with potato research by location.

[The information follows:]

ARS Headquarters.—Funds held at headquarters for extramural research on ring rot, early dying and scab disease problems, and aphid and beetle control.

Albany, CA [PGEC].—Development of new genetic engineering techniques and gene expression of economically important genes of potato.

Albany, CA [WRRC].—Plant cell transformation studies for improved potato quality.

Athens, GA.—Nondestructive measurement of potato variety.

Aberdeen, ID.—Development of new improved pest resistant varieties and research on disease control.

Kimberly, ID.—Irrigation and cultured methods to control or reduce incidence of dark end disorder.

Beltsville, MD.—Germplasm evaluation, gene enhancement, and breeding improved varieties; protoplast fusion and other genetic engineering techniques; processing germplasm introductions; pathogen-host interactions and genetics of resistance; and biological control of potato insects. Field trials for the breeding program are located at Presque Isle, ME.

Frederick, MD.—Study of exotic fungal pathogens of potato.

Orono, ME.—Potato disease control, integrated pest management techniques, and effect of soil and water stress on potato production.

East Grand Forks, MN.—Physical properties and other factors associated with processed potato quality, volatiles and prediction of potato quality from bulk storage, processing quality factors of potatoes following storage, and evaluation of potential new varieties for processing attributes.

Ithaca, NY.—Evaluation of potato germplasm for nematode resistance, biology and control of golden nematode, and biological control mechanisms for potato diseases.

Wooster, OH.—Management and control of potato insects.

Wyndmoor, PA.—Biochemical and ultrastructural features of interactions of potato diseases with host plant, mycotoxin production in plants, and improved food processing methods for potatoes.

Prosser, WA.—Evaluation of potato germplasm, gene enhancement, and development of new improved varieties.

Yakima. WA..—Insect behavior, insect ecology, biological control, and improved methods of control of potato insects.

Madison, WI.—Classification, evaluation preservation, and distribution of introduced germplasm; potato genetics and cytogenetics; and protoplast fusion and other genetic engineering techniques.

Mr. WHITTEN. By location, what is the funding and staff for potato research for fiscal year 1989, 1990, and 1991?

[The information follows:]

POTATO RESEARCH

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Albany, CA	$503,300	2.5	$1,039,200	5.2	$1,039,200	5.2
Athens, GA			38,700	.2	38,700	.2
Aberdeen, ID	306,200	1.5	300,500	1.5	300,500	1.5
Kimberly, ID	395,600	2.0	388,200	2.0	388,200	2.0
Orono, ME	261,800	1.3	257,000	1.3	257,000	1.3
Beltsville, MD	2,052,900	10.3	2,053,100	10.3	2,053,100	10.3
Frederick, MD	70,900	.3	69,500	.3	69,500	.3
East Grand Forks, MN	1,221,900	6.1	1,162,800	5.8	1,162,800	5.8
Ithaca, NY	237,000	1.2	259,900	1.3	259,900	1.3
Wooster, OH	23,600	.1	23,200	.1	23,200	.1
Wyndmoor, PA	896,100	4.5	869,300	4.3	869,300	4.3
Prosser, WA	758,000	3.8	822,400	4.1	822,400	4.1
Yakima, WA	451,500	2.3	486,700	2.4	486,700	2.4
Madison, WI	557,700	2.8	547,700	2.7	547,700	2.7
ARS Headquarters [1]	1,143,200	0	1,518,100	0	1,518,100	0
Totals	8,879,700	38.7	9,836,300	41.5	9,836,300	41.5

[1] Funds provided for cooperative research to the following States: California, Colorado, Florida, Idaho, Massachusetts, Maine, Michigan, Minnesota, North Carolina, North Dakota, New York, Ohio, Oregon, Pennsylvania, Washington, and Wisconsin.

Mr. **Whitten**. Please provide for the record a table for 1989, 1990, and 1991 showing the research funding devoted to ring rot, early dying, marketing, aphids, potato beetle, weeds, variety development, soils, and agricultural engineering.

[The information follows:]

POTATO RESEARCH

	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated
Ring rot	$567,100	$555,200	$555,200
Early dying	529,100	523,800	523,800
Marketing	2,276,500	2,771,300	2,771,300
Aphids	200,000	394,600	394,600
Potato beetle	666,300	935,200	935,200
Variety development	1,616,500	1,630,200	1,630,200
Soils	554,100	545,400	545,400
Agricultural engineering	210,300	206,400	206,400

AGRICULTURAL RESEARCH AND DEVELOPMENT CONSORTIUM

Mr. **Whitten**. Please describe for the Committee the work underway at the Agricultural Research and Development Consortium.

Dr. **Plowman**. The work covers a broad range of research: plant biotechnology, sensors for fermentation processes, molecular biology of microbial and animal cells, biopesticides, enzyme technology, and application systems for agrichemicals.

Mr. **Whitten**. Please describe the research proposals that have been funded by the Consortium.

Dr. **Plowman**. The Consortium has funded 29 projects for $3.5 million approximately at the following institutions: University of Illinois at Champaign, USDA-ARS Northern Regional Research Center, USDA-ARS Eastern Regional Research Center, Northern

Illinois University, Southern Illinois University, Argonne National Laboratory, National Institute of Standards and Technology, and USDA-ARS Western Regional Research Center.

Mr. WHITTEN. Please provide a table for the record indicating a funding history for the Consortium.

[The information follows:]

Location	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 Estimated
Peoria, IL	$2,000,000	$1,952,700	$1,952,700

AQUACULTURE RESEARCH

Mr. WHITTEN. Please describe for the record the work you are doing in connection with aquaculture research, by location.

[The information follows:]

INTRAMURAL

Southern Regional Research Center, New Orleans, LA.—ecological causes of off-flavor in catfish in pond environments.

Regional Parasite Research Lab, Auburn, AL.—approaches for early diagnosis and control of disease and parasites in catfish.

Stoneville, MS.—breeding and genetics research to improve production traits and disease resistance in catfish.

Lane (Tishomingo), OK.—production system research to improve the efficiency of production of high quality catfish in surface waters in the Southwest.

Oceanic Institute, Waimanalo, HI.—improve the use of feed grains in diets for shrimp and warmwater finfish and diagnosis and control of diseases.

EXTRAMURAL

Conservation Fund, Shepherdstown, WV.—linking high intensity fish culture with plant culture, water conservation, and water quality.

Oceanic Institute, Waimanalo, HI.—improve the use of feed grains in diets of shrimp and warmwater finfish.

Mr. WHITTEN. By location, what is the funding and staff for aquaculture research for fiscal years 1989, 1990 and 1991?

[The information follows:]

AQUACULTURE RESEARCH

Location	Fiscal year 1989		Fis[illegible]r 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Auburn, AL	0.1	$64,500	0.1	$63,300	0.1	$63,300
Honolulu, HI:						
Oceanic Inst		732,700		[1] 1,175,600		1,175,600
Other	2.0	159,500	2.0	156,500	2.0	156,500
Total, Hawaii	2.0	892,200	2.0	1,332,100	2.0	1,332,100
New Orleans, LA	3.3	803,800	3.3	788,800	3.3	788,800
Stoneville, MS	2.0	506,300	2.0	496,900	2.0	496,900
Lane, OK	1.0	274,900	2.0	[2] 494,100	2.0	494,100
Shepherdstown, WV		654,000		[3] 1,090,100		1,090,100
Total	6.4	3,195,700	9.4	4,265,300	9.4	4,265,300

[1] Includes increase of $456,500 in FY 1990. These funds are held at Honolulu, HI, but are expended through an extramural agreement with the Oceanic Institute.

[2] Includes increase of $147,900 in FY 1990.

[3] Increase of $1,090,100 in FY 1990. These funds are held at Headquarters but are expended through and extramural agreement with the Spring and Groundwater Resource Institute. Net funding of the agreement is $981,070. Excludes $540,100 at Kearneysville, WV, for research on horticultural crops.

OFF-FLAVOR RESEARCH

Mr. Whitten. What has been accomplished during the past 12 months in connection with research on off-flavor of catfish?

Dr. Plowman. A number of accomplishments have been made in the past 12 months in connection with research on off-flavor of catfish. An assessment of numerous feed ingredients fed to catfish showed that the typical catfish flavor is an inherent quality and not influenced by feeds. This observation will provide a sound basis for least-cost diet foundation. Metabolic research showed an involvement of fat content in catfish and the severity and rate of change in off-flavor concentration. Improved methods were developed to detect low levels of geosmin and 2-methylisoborneol, two earthy/musty off-flavor chemicals. Knowledge was gained on how to cause microorganisms to increase and to decrease biosynthesis of off-flavor chemicals, the first step in controlling off-flavor.

CATFISH RESEARCH

Mr. Whitten. Please describe for the record the work you are doing in connection with catfish research, by location.

[The information follows:]

Auburn, AL.—Edwardsiella ictaluri causes enteric septicemia of catfish (ESC). Tens of millions of dollars are currently lost and dollar losses will continue to increase proportionately to catfish production without rapid methods of ESC detection. A monoclonal antibody was developed that will detect *Edwardsiella* early enough to therapeutically treat the infected catfish.

New Orleans, LA.—The impact of environmental off-flavors and feed ingredients on farm-raised catfish flavor quality has been examined by a trained sensory panel and instrumental analyses. Improved methods to detect low levels of geosmin and 2-methylisoborneol (MIB), two earthy/musty off-flavors, have been developed and used in studies to determine the influence of metabolic rate and fat content on the uptake and purging of these compounds. Indirect enzyme-linked immunosorbent assays (ELISA) for geosmin and MIB have been developed. Training was provided in sensory evaluation techniques to quality control personnel of catfish processors.

Lane, OK.—Research was conducted to increase catfish production per unit area of pond by increasing stocking rate and improving techniques for maintaining water quality. Results indicate that maintaining water quality in production ponds, by recirculating water through biological filters, allows the stocking rate to be increased substantially, thereby increasing fish yield per unit area of pond. Research was initiated on the causes of off-flavor in farm-raised fish. Chemical analyses on various samples are in progress.

Stoneville, MS.—Four strains of channel catfish and one strain of blue catfish were collected. Matings were made, resulting in 21 strains and strain crosses. Attempts at sex reversal were not successful. Measurements on 15 strains of catfish to environmental nitrates were made on fertilization rate, weight gain, and susceptibility.

Mr. Whitten. By location, what is the funding and staff for catfish research for fiscal years 1989, 1990 and 1991?

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Auburn, AL	1.1	$64,500	1.1	$63,300	1.1	$63.300
New Orleans, LA	9.5	803,800	9.5	788,800	9.5	788,800

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Stoneville, MS	2.0	506,300	2.0	496,900	2.0	496,900
Lane, OK	2.0	274,900	3.0	[1] 494,100	3.0	494,100
Total	14.6	1,649,500	15.6	1,843,100	15.6	1,843,100

[1] Includes fiscal year 1990 increase of $147,900.

DWARF BUNT RESEARCH

Mr. WHITTEN. Please describe for the Committee the work you are doing in connection with dwarf bunt research, by location.

Dr. PLOWMAN. The ARS dwarf bunt research program is focused on wheat breeding and germplasm evaluation for dwarf bunt resistance at Pullman, Washington; identification of sources of dwarf bunt resistance tissue culture techniques to develop dwarf bunt resistance genotypes and monoclonal antibodies and molecular DNA probes to monitor the ecology of the pathogen all at East Lansing, Michigan.

Mr. WHITTEN. By location, what is the funding and staff for dwarf bunt research for fiscal years 1989, 1990, and 1991?

[The information follows:]

	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Pullman, WA	0.1	$40,900	0.1	$48,000	0.1	$48,000
East Lansing, MI	1.0	51,200	1.0	45,600	1.0	45,600
Total	1.1	92,100	1.1	93,600	1.1	93,600

EASTERN FILBERT BLIGHT

Mr. WHITTEN. Please describe for the Committee the work you are doing in connection with eastern filbert blight, by location.

Dr. PLOWMAN. ARS conducts research on Eastern filbert blight at Corvallis, Oregon. This research is focused on determining the epidemiology of the disease in order to develop comprehensive and integrated disease management strategies. Specifically, this research is designed to determine the environmental factors that affect production and dispersal of the pathogen and the infection process. In addition, the relative resistance of different host genotypes is being evaluated. Finally, orchard management practices that may reduce spread of the pathogen and disease development are being investigated.

Mr. WHITTEN. By location, what is the funding and staff for eastern filbert blight research for fiscal year 1989, 1990, and 1991?

[The information follows:]

	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Corvallis, OR	1.1	$180,400	1.1	$161,200	1.1	$161,200

PECAN APHID

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with pecan aphid research, by location.

Dr. **Plowman**. The pecan aphid research includes biological and chemical control and integrated pest management studies at Byron, Georgia, and host plant resistance studies at Stoneville, Mississippi.

Mr. **Whitten**. By location, what is the funding and staff for pecan aphid research for fiscal years 1989, 1990, and 1991.

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Byron, GA	$391,500	2.2	$388,100	2.2	$388,100	2.2
Stoneville, MS	45,900	.3	44,700	.3	44,700	.3
Total	437,400	2.5	432,800	2.5	432,800	2.5

MEADOWFOAM

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with meadowfoam research, by location.

Dr. **Plowman**. ARS is conducting inhouse research at Peoria, IL, and cooperative research with Oregon State University to accelerate the commercial development of meadowfoam.

At Peoria, Illinois we are conducting oil utilization research at our Northern Regional Research Laboratory at this location. Emphasis is being given to determining the chemical and physical uniqueness of meadowfoam oil and oil components for potential industrial uses.

At Corvallis, Oregon through a cooperative agreement with Oregon State University we are developing improved varieties of meadowfoam with increased seed yield and increased percentage of oil in the seed. Seed of three or four of the best current strains have been increased and are being evaluated by growers in on-farm tests. We also are developing improved cultural practices for growing meadowfoam, including plant spacing, nitrogen fertilization, weed control, reduction of disease, management of pollinating bees, and more efficient harvesting methods.

Mr. **Whitten**. By location, what is the funding and staff for meadowfoam research for fiscal years 1989, 1990, and 1991?

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Peoria, IL	$390,200	1	$383,000	1	$383,000	1

Cooperative research with Oregon State University is supported through specific cooperative agreements from the funding allocated to Peoria. Funding for these cooperative agreements are:

Fiscal year 1989 .... $165,000

Fiscal year 1990	162,700
Fiscal year 1991	162,700

MILKWEED

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with milkweed research, by location.

Dr. **Plowman**. ARS is doing no research on milkweed. Through a special grant from the Office of Critical Materials, CSRS, the University of Nebraska, Lincoln, NE, is evaluating the commercial possibility for milkweed floss, in cooperation with a private corporation, Natural Fibers, Inc. In 1989, 200 acres of milkweed were grown in order to gather yield data, study harvesting, evaluate problems with pests, and obtain sufficient milkweed floss for commercial sale by Natural Fibers, Inc. This firm blends the fiber with down and claims improved breathability and insulation value compared with down alone. Plans for 1990 are to continue to improve cultural practices, harvesting and separation, and recovery of the floss.

Mr. **Whitten**. By location, what is the funding and staff for milkweed research for FY's 1989, 1990 and 1991?

Dr. **Plowman**. ARS has not had a budget for milkweed research in these years. Special grants, through CSRS, were $68,000 in 1989, $79,000 in 1990, and there is no proposed funding for 1991.

MUSCADINE GRAPES

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with muscadine grapes by location.

Dr. **Plowman** We are conducting research on cultural studies and control of muscadine grape diseases at Poplarville, Mississippi. Because of grower problems with establishment of young plantings, we have research on pruning, trellising, weed control, mulches, and drip irrigation. We also are establishing a collection of muscadine varieties at Poplarville. We have an extramural research agreement with Mississippi State University on control of the crown gall disease and processing technology on grape juice and juice products.

Mr. **Whitten**. By location, what is the funding and staff for muscadine grape research for fiscal years 1989, 1990, and 1991?

Dr. **Plowman**. The only location where we conduct muscadine grape research is at Poplarville, Mississippi. The estimated level of funding for this research for fiscal years 1989, 1990, and 1991 will be provided.

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Poplarville, MS	1	$252,200	1	$247,600	1	$247,600

KENAF

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with kenaf, by location.

[The information follows:]

Peoria, IL.—The Northern Regional Research Center at Peoria, through a cooperative agreement, is funding the U.S. Forest Products Laboratory in Madison, Wisconsin, to conduct a laboratory study of kenaf for liner board and lightweight printing paper.

Stoneville, MS.—ARS is funding a cooperative agreement at Mississippi State University to develop improved cultural practices, pest management techniques, harvesting methods, and handling and storage procedures for producing kenaf in Mississippi. Pilot-test quantities are being produced for tests in the new paper mill, Newsprint South, Inc., at Grenada, Mississippi.

Lane, OK.—The research at this location includes variety trials and the development and evaluation of improved cultural practices for producing kenaf in this region.

College Station, TX.—The objective of the research at this location is to develop methods for controlling nematodes when they attack kenaf.

Weslaco, TX.—ARS is conducting agronomic and breeding research in the Lower Rio Grande Valley to increase production efficiency of the crop in that area.

Mr. **WHITTEN**. By location, what is the funding and staff for kenaf research for fiscal years 1989, 1990, and 1991?

[The information follows:]

KENAF RESEARCH

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	SY	Available	SY	Available	SY	Estimated
Headquarters [1]		$300,000		$50,000		$50,000
Peoria, IL [2]			0.3	150,000	0.3	150,000
Stoneville, MS [1]		75,000		394,000		394,000
Lane, OK	1.0	148,500	1.0	145,800	1.0	145,800
College Station, TX			0.3	46,800	0.3	46,800
Weslaco, TX	0.8	148,500	1.5	319,800	1.5	319,800
Totals	1.8	672,000	3.1	1,106,400	3.1	1,106,400

[1] All funds used for cooperative agreement research outside of ARS.

[2] A portion of funds used for cooperative agreement research outside of ARS.

SOYBEAN-BASED INK

Mr. **WHITTEN**. Please describe for the Committee the work you are doing in connection with soybean-based ink, by location.

Dr. **PLOWMAN**. The present research focus is chiefly on newsinks—lithographic and letterpress—where the potential for additional soybean utilization is about 30 million bushels per annum. Work is in progress to develop ink formulations based entirely on soybean oil and to reduce costs of production so as to be competitive with petroleum-based components used at present. In addition to this work, performed at the USDA-ARS Northern Regional Research Center, ARS is funding a collaborative research agreement with Lehigh University on heat-set inks.

Mr. **WHITTEN**. By location, what is the funding and staff for soybean-based ink research for fiscal years 1989, 1990 and 1991?

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Peoria, IL	$158,300	2.1	$275,700	2.2	$275,700	2.2

IR-4 PROGRAM

Mr. WHITTEN. Please describe for the Committee the IR-4 program and the ARS role under that program.

Dr. PLOWMAN. The IR-4 program works in conjunction with the pesticide industry to provide the necessary data to register pesticides for use in minor use or low acreage crops. ARS conducts research for the registration of approximately 130 food projects and 300 nonfood projects each year. ARS contributes efficacy, phytotoxicity, and residue data for specific pesticide projects. These data are used to support the establishment of EPA tolerances and support the product registration for minor uses by the pesticide industry.

Mr. WHITTEN. How are IR-4 projects selected.

Dr. PLOWMAN. Minor use needs are identified by growers, researchers, and Extension specialists. The researchable needs are prioritized at national IR-4 workshops. Annual selections of tentative projects are made at regional meetings by the IR-4 State and ARS liaison representatives. These selections are based in part on the priorities established by the workshops and by regional and national needs. Final selection of projects is coordinated with the States and ARS and with the field and chemical residue studies at a national meeting each year. Availability of scientific expertise and resources to conduct the studies are the final factors in project selection.

Mr. WHITTEN. By location, what is the funding and staff for IR-4 research for fiscal years 1989, 1990, 1991?

[The information follows:]

IR-4 PROGRAM FUNDING

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Salinas, CA	$42,500	0.1	$41,700	0.1	$41,700	0.1
Washington, DC			30,800	1.0	30,800	1.0
Orlando, FL	22,000	0	10,700	0	10,700	0
Tifton, GA	245,600	.1	241,000	.1	241,000	.1
Urbana, IL	10,500	0	10,300	0	10,300	0
Beltsville, MD	318,400	1.7	312,500	1.6	312,500	1.6
Frederick, MD	48,300	.1	47,400	.1	47,400	.1
Poplarville, MS	11,600	.1	11,400	0	11,400	0
Delaware, OH	31,400	.2				
Wooster, OH	5,500	0	5,400	0	5,400	0
Corvallis, OR	63,100	.2	62,000	.5	62,000	.5
Charleston, SC	52,500	.2	51,500	.2	51,500	.2
Weslaco, TX	63,300	.1	73,000	.1	73,000	.1
Prosser, WA	50,800	.2	49,900	.2	49,900	.2
Yakima, WA	134,800	.7	132,300	.2	132,300	.2
Held by HQTS	54,300	.1	53,200	.1	53,200	.1
Total	1,154,600	3.8	1,133,100	4.2	1,133,100	4.2

HUMAN NUTRITION RESEARCH

Mr. WHITTEN. Please describe for the record the funding for the human nutrition research facilities for fiscal years 1989, 1990, and

1991. Also for the record indicate the funding and staff required for each of those facilities if they were operated at full capacity.

Dr. PLOWMAN. The funding for each of the ARS Human Nutrition Research Centers for fiscal years 1989, 1990, and 1991, together with the staff and funding required for operating at full capacity, will be provided for the record.

[The information follows:]

AGRICULTURAL RESEARCH SERVICE HUMAN NUTRITION RESEARCH

[Estimated funds in millions]

Center	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated	Staff and funds for full operation
Beltsville Human Nutrition Research Center (Beltsville, MD)	$7.31	$7.48	$7.54	Full staffing capacity of 42 scientist years and $12 million.
Grand Forks Human Nutrition Research Center (Grand Forks, ND)	6.33	6.59	6.61	Full staffing capacity of 24 scientist years and $10 million.
Human Nutrition Research Center on Aging at Tufts University (Boston, MA)	13.35	13.54	13.55	Full staffing capacity of 50 scientist years and $18 million.
Children's Nutrition Research Center at Baylor College of Medicine (Houston, TX)	8.34	9.63	9.63	Full staffing capacity of 50 scientist years and $15 million.
Western Human Nutrition Research Center (San Francisco, CA)	4.01	4.22	4.24	Full staffing capacity of 40 scientist years and $12 million.
Other ARS Human Nutrition Research	2.66	2.67	2.71	

HUMAN NUTRITION RESEARCH

Mr. WHITTEN. Please describe for the record the type of research carried out at each of the five centers.

[The information follows:]

Beltsville Human Nutrition Research Center, Beltsville, MD.—Composition of foods and bioavailability of food nutrients required by humans; energy metabolism in relation to obesity and energy requirements for weight maintenance; dietary reduction of risk factors for nutrition-related chronic disorders such as coronary heart disease, cancer, and maturity onset diabetes; human requirements and metabolic roles of carbohydrates, dietary fibers, lipids, zinc, chromium, selenium, vitamin E, and vitamin A; and family economics.

Grand Forks Human Nutrition Research Center, Grand Forks, ND.—Nutritional requirements for zinc, magnesium, boron, copper, and other minor elements and their relationship to optimal health, function, and performance; physiological and biochemical factors influencing minor element requirements in all age groups and biological availability of minerals.

Human Nutrition Research Center on Aging at Tufts University, Boston, MA.—Nutritional requirements of the elderly for optimal health, function, and performance; the relationship of nutrition to the aging process; role of diet in the prevention of major chronic degenerative conditions. Emphasis has been given to role of diet on bone health, prevention of cataracts, immune response and to the importance of exercise on body composition. The requirements and/or tolerances of elderly for folacin, vitamin B-12, vitamin A, vitamin B-6, vitamin K and vitamin D were studied.

Children's Nutrition Research Center at Baylor College of Medicine, Houston, TX.—Nutrient requirements in infants, children, pregnant and lactating women; role of diet for optimum growth and physical and mental development. Emphasis has been on use of stable nonradioactive isotopes as markers in studies related to energy, protein, iron, and calcium requirements for growth of young infants and lactation in women.

Western Human Nutrition Research Center, San Francisco, CA.—Development of reliable, efficient, inexpensive methods for defining nutritional status; effects of marginal nutrient levels on performance and immune function; developing nutritional criteria for evaluation of intervention programs; conducted research on human nutritional requirments, including omega-3 fatty acids, vitamin C, folacin, and molybdenum.

Mr. WHITTEN. For the record please describe the major research programs in the field of human nutrition carried out at various universities around the country.

Dr. PLOWMAN. The major research programs in the field of human nutrition research at the various universities in the U.S. include those at land-grant institutions as well as medical schools. These include Cornell University, Ithaca, NY; University of California, Davis, CA; and the University of Wisconsin, Madison, WI. Medical schools which have NIH-funded Clinical Nutrition Research Units are University of Chicago, University of California at Davis, University of Washington, Vanderbilt University, University of Alabama at Birmingham, Cornell University at New York City, Harbor-UCLA Medical Center, and University of Wisconsin. Columbia University has an NIH funded Obesity Center, a Special Center of Research (SCOR) on Arteriosclerosis and a program on nutrition of low birth-weight infants. The University of California at San Diego and the University of Iowa also have SCOR programs on Arteriosclerosis. The University of Iowa also has a program on nutrition of normal infants. Howard University has a funded program on nutrition and pregnancy; at the University of California at Berkeley, child nutrition and chronic disease; at the University of Texas Health Science Center at Dallas, a program of research on lipid metabolism; at the Oregon Health Science Center, fatty acid requirements; and at the University of Minnesota, research on sodium, potassium, and hypertension.

Mr. WHITTEN. Does USDA provide any funding for human nutrition research other than for the work at the five centers?

Dr. PLOWMAN. ARS supports a total of $2.67 million of human nutrition research in addition to that of its five Human Nutrition Research Centers. In FY 1990, this will include $671,800 at the Soil, Plant and Nutrition Laboratory, Ithaca, NY; $965,800 at the Northern Regional Research Center, Peoria, IL; $437,600 at the Western Regional Research Center, Albany, CA; $493,100 at the Family Economics Research Group, Hyattsville, MD; and $105,600 at the Non-Ruminant Animal Nutrition Laboratory, Beltsville, MD. Other USDA agencies which have FY 1990 appropriated funds for human nutrition research include Cooperative State Research Service, $7.5 million—including $1.5 million for competitive grants; Human Nutrition Information Service, $7.9 million; Economic Research Service, $0.9 million; and Food and Nutrition Service, $1.3 million.

GUAYULE

Mr. WHITTEN. What developments have occurred in the guayule program during the past 12 months?

Dr. PLOWMAN. ARS conducts guayule research at five locations. Coordinated research between Beltsville, Maryland, and Phoenix, Arizona, has led to new seed treatments and planting methods for successful direct seeding to enhance possible commercialization. Irrigation guidelines have also been developed at Phoenix for direct seeding, and germplasm selection studies have begun to identify guayule cultivars for improved seedling establishment. New superior guayule cultivars have been sent to a location in California for testing and are included in regional trials for the four Southwestern States. Rubber content and quality studies have been conducted at Peoria, Illinois, and Phoenix, Arizona, showing that proper harvesting and baling techniques can be used to minimize rubber deterioration over a 6-week storage period prior to processing. Bioregulated, hydroponically grown guayule plants increased both in biomass and rubber content but need further field testing. Progress on dryland guayule research has been affected by severe drought during the last two years.

Mr. Whitten. What is the current level of funding received from the Department of Defense for work on guayule and how are the funds being used?

Dr. Plowman. No new funds were received from the Department of Defense for guayule research in FY 1990.

Mr. Whitten. By location, what is the funding and staff for guayule research for fiscal years 1989, 1990, and 1991?

[The information follows:]

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Phoenix, AZ	$400,700	4.4	$393,300	4.4	$393,300	4.4
Pasadena, CA	160,300	1.2	160,900	1.0	160,900	1.0
Peoria, IL	137,500	1.0	134,900	.8	134,900	.8
Beltsville, MD	48,100	.4	47,400	.4	47,400	.4
Weslaco, TX	169,100	1.1	165,900	1.0	165,900	1.0
Total	915,700	8.1	902,400	7.6	902,400	7.6

JOJOBA

Mr. Whitten. Please describe for the Committee the research you are doing in connection with jojoba.

Dr. Plowman. Jojoba seed meal can be used in animal feed provided it is detoxified. Experiments by ARS on detoxification have been performed at Hyder, Arizona, and field testing will take place at El Reno, Oklahoma. Also, unique proteins have been isolated, at the ARS Northern Regional Research Center, from jojoba meal and are being tested in conjunction with industry, as components of foams in cosmetics applications. A table will be provided for the record which shows ARS resources devoted to jojoba research for fiscal years 1989, 1990 and 1991.

[The information follows:]

Location	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated
Peoria, IL	$114,100	$112,000	$112,000

GRASSHOPPERS AND MORMON CRICKETS

Mr. **Whitten**. Please describe for the Committee the work you are doing in connection with research on grasshoppers and Mormon crickets.

Dr. **Plowman**. Most of our research effort is in support of the interagency grasshopper Integrated Pest Management program. This involves more effective grasshopper baits; utilization of grasshopper pathogens such as protozoa, viruses and fungi; investigations on parasites and predators; and construction of an expert system to guide rangeland managers. Mormon cricket research is focused on the development of a protozoan disease. This work is being done in cooperation with Montana State University and BLM.

Mr. **Whitten**. By location, what is the funding for grasshopper and Mormon cricket research for fiscal years 1989, 1990 and 1991?

[The information follows:]

	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated
Booneville, AR	$28,800	$28,200	$28,200
Beltsville, MD	19,800		
Bozeman, MT	619,200	611,500	611,500
Ithaca, NY [1]	138,900	164,800	164,800
Total	$806,700	$804,500	$804,500

[1] Grasshopper Fungus Research

AFLATOXIN RESEARCH

Mr. **Whitten**. Please describe for the Committee the work you have underway on aflatoxin.

Dr. **Plowman**. ARS research primarily addresses the problem of aflatoxin in peanuts, corn, and cottonseed by seeking ways to prevent the production of the toxin in the commodities as they are produced before harvest. Specifically we are using several different strategies such as developing resistant crops, biocontrol methods to prevent growth of the fungus, and developing ecological approaches to minimize availability of the infective forms of the fungus. A smaller part of the aflatoxin program develops fast and accurate analytical methodology and devises methods to prevent animal toxicity and the occurrence of residues.

Mr. **Whitten**. By location, please indicate the dollars and staff years devoted to aflatoxin research in fiscal years 1989, 1990 and 1991.

[The information follows:]

AFLATOXIN RESEARCH

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Dawson, GA	$318,300	2	$497,275	2	$897,275	4
Tifton, GA	254,000	1	279,000	1	479,000	2
Peoria, IL	744,400	4	733,000	3	1,133,000	5

AFLATCXIN RESEARCH—Continued

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
New Orleans, LA	1,344,400	9	1,504,375	8	1,904,375	9
Mississippi State, MS	352,500	2	345,900	2	545,900	2
College Station, TX	768,800	3	519,400	2	519,400	2
Headquarters, NPS			369,750		369,750	
Total	3,782,400	21	4,248,700	18	5,848,700	24

SULFUR DIOXIDE ON TABLE GRAPES

Mr. WHITTEN. Last year the Committee provided funds for a study on the use and residue of commercial sulfur dioxide on table grapes. Where is this work being carried out and what are you doing?

Dr. PLOWMAN. About 45 percent of the sulfur dioxide research funds will remain in ARS at Fresno, CA, to develop a new reduced treatment dosage of grapes that will result in lowered residue while effectively controlling the Botrytis pathogen.

The remaining 55 percent will go to the California Table Grape Commission which will fund the University of California at Berkeley and Davis, and the California State University at Fresno. The Universities will conduct sulfur dioxide residue studies, and improve application technologies as a means to reduce residue.

Mr. WHITTEN. What are your plans for fiscal year 1991?

Dr. PLOWMAN. The fiscal year 1990 objectives and funding distribution will continue in fiscal year 1991.

SYSTEMATIC ENTOMOLOGY LAB

Mr. WHITTEN. Last year the Congress provided funds to upgrade the Systematic Entomology Laboratory at Beltsville. What is the current status of this effort?

Dr. PLOWMAN. We have hired a scientist to fill our top research priority position to work on pyralid moths, an example being the European corn borer. The caterpillars of these moths are extremely destructive to agricultural crops. This will allow us to better meet the needs of APHIS and other agricultural organizations. We are now recruiting support personnel to assist our other taxonomists. Some of the funds are being used to cover normal cost of doing research.

URBAN PEST RESEARCH

Mr. WHITTEN. Please describe the work you have underway on urban pest research. Last year Congress provided additional funds for urban pest research. How are these funds being used?

Dr. PLOWMAN. Flea research emphasizes studies of the mode of action of insect growth regulators, characterization population dynamics, and the quantitative ecology of host-flea interactions. Research emphasis for peridomestic cockroaches is on behavior, ecology, and population dynamics. An Insect Control System toxic bait is being patented and developed for commercialization. Another invention is a filtered soffit vent that will provide pest control operators access to difficult-to-reach populations in attic soffits and wall voids. In addition, field evaluations of strategies for Asian cockroach control are underway. Research on domestic cockroaches is primarily targeted to the control of the German cockroach. Current research emphasis is on the behavior of cockroaches in simulated kitchens and on the evaluation of new toxicants and repellents as effective and safe components of control programs. A cooperative research project is also underway to characterize the magnitude and impact of cockroach allergens in the urban environment.

In the broader context of urban pest research, ARS is conducting studies to develop new methods for the management of the imported fire ant in both rural and urban settings. Four chemical products have been approved and commericalized for imported fire ant control on non-cropland areas. When used as directed, these products are 90 percent or more effective. Research is also being conducted on the control of mosquitoes, gnats, and sand flies that may be urban pests and that have potential for disease transmission. In addition, research on ticks and house flies is designed to provide methods for their control by urban and suburban residents and professional pest management specialists.

Additional funds provided for urban pest research last year are being used to develop a field kit that will provide a rapid, definitive determination of insecticide resistance profiles of German cockroach populations. When available, such a kit could be used by a pest control operator to prescribe programs to control resistant populations or, even, to avoid or delay the development of resistance.

Mr. WHITTEN. By location, what is the funding for urban pest research for fiscal years 1989, 1990 and 1991?

[The information follows:]

	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated
Gainesville, FL	$4,161,600	$4,232,200	$4,232,200

MYCOPLASMA

Mr. WHITTEN. Please describe for the Committee the work you have underway in mycoplasma.

Dr. PLOWMAN. ARS is currently conducting mycoplasma research at the South Central Poultry Research Laboratory, Mississippi State, Mississippi, and at the Southeast Poultry Research Laboratory, Athens, Georgia. The research at Mississippi State is directed toward developing rapid diagnostic tests for mycoplasmosis and identifying morbidity, condemnation, and production efficiency losses due to mycoplasma and other organisms. In the research program at Athens, mycoplasma is one of the agents involved in a study of the relationship of climatic environment on the development and transmission of respiratory diseases in chickens. The objective is to determine optimal environments for decreasing respiratory disease and therefore increasing productivity.

Mr. **Whitten**. By location, what is the funding and staff for mycoplasma research for fiscal years 1989, 1990 and 1991?

[The information follows:]

MYCOPLASMA RESEARCH

Location	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Athens, GA	$98,800	0.8	$96,900	0.8	$96,900	0.8
Mississippi State, MS			98,600	1.5	98,600	1.5
Bushland, TX	38,800		38,100		38,100	
Totals	137,600	8	233,600	2.3	233,600	2.3

SWEET POTATO WHITEFLY

Mr. **Whitten**. Please describe for the Committee the work you have underway on sweet potato whitefly.

Dr. **Plowman**. The agency has a modest effort on sweet potato whitefly in several locations. At Orlando, FL, we are attempting to determine how this insect induces early ripening syndrome. We are also cooperating with the University of Florida to determine if parasites can be used in control strategies. Control for infestations in greenhouses is being developed in Beltsville, MD, and Newark, DE. Research at the Western Cotton Research Laboratory, Phoenix, AZ, includes developing cotton cultivars resistant to the sweet potato whitefly. At Salinas, CA, efforts are under way to develop lettuce with whitefly resistance. Our minor use program at Corvallis, OR, and Charleston, SC, is developing data to support pesticide registration for control of whiteflies.

Mr. **Whitten**. By location, what is the funding and staff for sweet potato whitefly research for fiscal years 1989, 1990 and 1991.

[The information follows:]

	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	Available	SY	Available	SY	Estimated	SY
Sweet Potato Whitefly:						
Phoenix, AZ	$89,100	0.7				
Salinas, CA	8,800		$25,400	0.1	$25,400	0.1
Newark, DE			93,000	.5	93,000	.5
Orlando, FL	100,400	1.0	241,300	2.0	241,300	2.0
Beltsville, MD	107,800	1.0	32,200	.1	32,200	.1
Total, Sweet Potato Whitefly	306,100	2.7	391,900	2.7	391,900	2.7
Other Related Whitefly:						
Corvallis, OR	52,700	.2	62,000	.2	62,000	.2
Charleston, SC	31,500	.1	30,900	.1	30,900	.1
Total, Related Whitefly	84,200	.3	92,900	.3	92,900	.3
Grand total	390,300	3.0	484,800	3.0	484,800	3.0

REPAIR AND MAINTENANCE OF FACILITIES

Mr. **Whitten**. Please provide for the record a detailed listing of the funds spent on repair and maintenance of facilities in fiscal year 1989.

Dr. **Plowman**. A detailed listing of funds obligated in fiscal year 1989 for repair and maintenance of facilities will be provided for the record.

[The information follows:]

Location and description	*Obligations*
Alabama: Auburn: New roof for main laboratory building, and for design of halon sprinkler system for parasite laboratory	$78,726
Arizona:	
Phoenix: Cold rooms	83,000
Tucson: HVAC System upgrade, deficiency study for Building No. 320; and new roofing	369,469
California:	
Albany: Hazardous waste (A-76), wool building (A-76), and paving project (A-76)	142,745
Riverside: Laboratory room	18,395
Shafter: Laboratory modernization in Building No. 27	18,272
Colorado: Security and fire detection system	88,866
Delaware:	
Georgetown: Replacement of underground tank	20,891
Newark: Environmental chamber replacement, and HVAC System	133,542
Florida:	
Ft. Lauderdale: Repairs to greenhouse/headhouse Building No. 6	8,113
Miami: Greenhouse HVAC System	43,023
Georgia:	
Athens: A-76 repairs; renovate electrical system; roofing on pilot plant; repair sidewalks; and building apron project	253,103
Savannah: Design for fumehood renovations	11,105
Tifton: Replacement of HVAC System in Building No. 1	1,009,278
Illinois:	
Peoria: Roof repairs; replace roof on laboratory wing; parking lot drainage system; replace cooling towers; design plans for asbestos removal; replace boiler house windows, north condensation return lines, and design services for boiler house roof; replace two chiller units at NRRC; repair of ARC well receptacles; repair two skidmore condensate pumps and sump pump; install safety showers	554,569
Urbana: Design and construction phases to replace a greenhouse shading system	87,398
Iowa: Ames: Design for repairs and improvements to electrical system; cooling tower project and roof repairs; complete renovation project for chemical fumehoods at NADC	413,737
Kansas: Manhattan: New HVAC System and roof replacement on main building	91,787
Louisiana: New Orleans: Design for replacement of the Administrative wing roof	18,547
Maryland: Beltsville: Beltsville Area Facilities improvements	4,499,293
Michigan: East Lansing: Asbestos removal, and deficiency evaluation of farm, biocontainment, security system, safety, water, and operational efficiency	38,477
Minnesota:	
Morris: Repair HVAC Systems in Buildings No. 1 and 2, and replace hydraulic hoist in shop	597,093
St. Paul: Design for repair of greenhouse heating and cooling system	13,240
Mississippi:	
Mississippi State: Modification of fumehood exhaust system	182,584
Stoneville: Refurbish exterior of Building No. 27; remodel Building No. 20; and repair asphalt roads and parking lots at cotton ginning laboratory	204,400
Missouri: Columbia: Repair of greenhouse	111,521
Montana: Sidney: Reglaze greenhouse and replace the cooling pad system	86,550

Location and description	*Obligations*
Nebraska:	
Clay Center: To change fumehood exhaust system and replace incandescent lighting system	320,075
Lincoln: Renovate forage insect laboratory	34,000
New Mexico: Las Cruces: Replace the perimeter fence at the Jornada Experimental Range, and repair and maintenance of facilities	123,602
New York:	
Ithaca: Laboratory renovation; design review for the central air system with chilled water service; and asbestos abatement	616,111
Orient Point: Roof replacement and PIADC deficiency study	668,690
North Carolina: Oxford: Insulation of windows, and renovation of roof in Buildings No. 3 and 7	108,790
North Dakota:	
Fargo: Renovation of intake stack and air handler and replacement of an obsolete electrical panel	536,256
Mandan: Update HVAC Systems, replace windows and paint in Buildings No. 2 and 3	81,698
Oklahoma:	
Durant: Replacement of natural gas distribution system	18,293
El Reno: Asbestos abatement; HVAC Systems; insulate waterlines; and replace four short lane bridges	51,903
Poteau: Asbestos surveys and abatement	2,849
Stillwater: Replace cooling pad distribution systems in greenhouse; repair siphon tubes on lake side of dam; and insulate newly repaired metal roof	157,218
Woodward: Asbestos surveys and abatement, replace underground gas tanks	25,043
Pennsylvania: Wyndmoor: Rewiring of the circuitry for emergency lighting and power system; asbestos removal; repair of underground service lines and replace transformers and switchgear	1,172,505
Puerto Rico: Mayaguez: Renovate electrical system	77,374
South Carolina: Florence: Insulation of shop	42,341
South Dakota: Brookings: Asbestos removal	125,686
Texas:	
Bushland: Improve or replacement of portable water distribution system; asbestos abatement; repairs to, remodeling, and replacement of fumehoods to meet code standards	70,104
College Station: Install station security lighting, locking and fire detection alarm system; replace roof; install HVAC chiller system; and asbestos abatement	520,253
Kerrville: Asbestos abatement; upgrade and construct electrical power service; replace roofs and insulate buildings; replace laboratory HVAC Systems	116,187
Temple: Asbestos abatement and replace HVAC System	36,862
Weslaco: Renovate greenhouse HVAC Systems; lighting and cooling systems; and replace fumehood to meet code standards	79,399
Washington: Yakima: Drill new water well at Moxee	89,979
Wyoming: Cheyenne: Replace greenhouse heating system	23,998
Total repair and maintenance	14,276,940

NEW RESEARCH FACILITIES

Mr. **Whitten**. Please describe for the record any laboratory space you have acquired during the past 12 months and indicate the reason why the facilities were required.

[The information follows:]

During the past 12 months, construction projects have been completed which resulted in the acquisition of the following laboratory space, to be used in support of ARS research programs.

Location:	*Amount (square feet)*
Aquatic Weed Laboratory Davis, CA	2,400
Tropical Fruit and Vegetable Laboratory Hilo, HI	2,200
U.S. Meat Animal Research Center Clay Center, NE	8,000

RESEARCH FACILITIES RELEASED

Mr. **Whitten**. Has any laboratory space been released by ARS in the past 12 months?

Dr. **Plowman**. No laboratory space has been released during the past 12 months.

NATIONAL ARBORETUM

Mr. **Whitten**. Please provide for the record the budget for the National Arboretum for fiscal years 1989, 1990 and 1991.

Dr. **Plowman**. Funding for the National Arboretum for fiscal year 1989 was $3,758,600, 1990 and 1991 is $3,669,500.

TROPICAL/SUBTROPICAL RESEARCH

Mr. **Whitten**. Please describe for the Committee the tropical and subtropical research being carried on under section 406 of the Agricultural Trade and Development Assistance Act.

Dr. **Plowman**. We are doing tropical and subtropical research in Hawaii and Puerto Rico under section 406 of the Agricultural Trade and Development Assistance Act. In Hawaii, our research programs relate to postharvest quarantine treatments which will help with export of tropical fruit crops grown in the Pacific Basin. In Puerto Rico, we have research programs on production and marketing of horticultural and forage crops. Emphasis is placed on evaluation of crop varieties and species thought to have the best economic potential for the Caribbean Basin and development of cultural and management practices for individual crops. Emphasis is placed on vegetables, fruit crops, cereal crops, cocoa, coffee, and tannier and other root crops. We also have an educational program where individuals receive training on production and marketing of individual crops. These specialists then return to their farming communities and help train others in tropical/subtropical agriculture.

Mr. **Whitten**. By location, what is the budget for this research for fiscal years 1989, 1990, and 1991?

[The information follows:]

Location	Fiscal year—		
	1989 Available	1990 Available	1991 estimated
Honolulu, HI	$166,600	$164,300	$164,300
Mayaguez, PR	679,900	670,400	670,400
Total	846,500	834,700	834,700

GERMPLASM

Mr. **Whitten**. By location, what is the funding and staff for germplasm facilities for fiscal years 1989, 1990, and 1991?

[The information follows]:

MAJOR PLANT GERMPLASM REPOSITORIES

Repository	Fiscal year 1989		Fiscal year 1990		Fiscal year 1991	
	FTE	Available	FTE	Available	FTE	Estimated
Seed Repositories						
Fort Collins, CO	24	$2,006,300	25	$1,978,700	25	$1,978,700
Experiment, GA	7	1,189,600	7	1,173,200	7	1,173,200
Aberdeen, ID	4	356,400	4	351,500	4	351,500
Urbana, IL	2	222,900	2	234,800	2	234,800
Ames, IA	9	1,178,600	9	1,162,300	9	1,162,300
Stoneville, MS	6	277,900	6	274,100	6	274,100
Geneva, NY	4	825,100	4	811,700	4	811,700
College Station, TX	3	363,000	3	358,000	3	358,000
Pullman, WA	12	1,243,300	13	1,226,200	13	1,226,200
Madison/Sturgeon Bay, WI	1	214,300	1	211,500	1	211,500
Total	72	7,877,400	74	7,782,000	74	7,782,000
CLONAL REPOSITORIES						
Davis, CA	3	323,900	3	319,400	3	319,400
Riverside/Brawley, CA	2	156,400	2	154,200	2	154,200
Washington, DC	1	138,100	1	136,200	1	136,200
Miami, FL	4	354,000	4	349,200	4	349,200
Mayaguez, PR	2	237,300	2	234,000	2	234,000
Orlando/Leesburg, FL	2	125,300	2	123,500	2	123,500
Honolulu/Hilo, HI	2	149,300	2	166,900	2	166,900
Geneva, NY	4	301,500	4	299,300	4	299,300
Corvallis, OR	3	773,500	3	667,200	3	667,200
Brownwood, TX	1	103,200	1	101,800	1	101,800
Total	24	2,662,200	24	2,551,700	24	2,551,700

GERMPLASM COLLECTIONS

Mr. WHITTEN. For the record, please list the germplasm collections that are maintained by ARS.

[The information follows:]

Each repository is responsible for preserving and distributing the germplasm assigned to it. The germplasm locations and principal crops assigned are:

SEED REPOSITORIES

Fort Collings, CO, (base seed collections).
Experiment, GA, (cowpea, melon, peanut, pepper, sorghum, sweet potato).
Urbana, IL, (short season soybean).
Ames, IA, (alfalfa, cabbage, corn, melon, sugarbeet, sunflower).
Aberdeen, ID, (barley, oat, rice, rye, triticale, wheat).
Stoneville, MS, (long season soybean).
Geneva, NY, (brassicas, celery, clover, pea, squash, tomato).
College Station, TX, (cotton).
Pullman, WA, (alfalfa, bean, chickpea, grasses, lentil, onion, safflower).
Madison-Sturgeon Bay, WI, (potato).

CLONAL REPOSITORIES

Davis, CA, (almond, fig, grape, kiwi, mulberry, olive, persimmon, pistachio, pomergranate, stone fruit, walnut).

Riverside/Brawley, CA, (citrus and related genera, date).

Washington, DC, (numerous woody ornamental genera).

Miami, FL/Mayaguez, PR, (avocado, banana, Brazil nut, cacao, coffee, jojoba, mango, plantain, sugarcane).

Orlando, FL, (grapefruit, lemon, lime, orange, tangerine).

Hilo, HI, (acerola cherry, atemoya, breadfruit, guava, litchi, macadamia, papaya, passion-fruit, peach palm, pili nut, pineapple, rambutan, starfruit).

Geneva, NY, (apple, hardy grape).

Corvallis, OR, (blackberry, blueberry, cranberry, current, filbert, gooseberry, hop, mint, pear, raspberry, strawberry).

Brownwood, TX, (chestnut, hickory, pecan).

PLANT GENE EXPRESSION CENTER

Mr. Whitten. Please describe for the Committee some of the accomplishments of the Plant Gene Expression Center during the past 12 months.

[The information follows:]

The Plant Gene Expression Center uses the latest and most sophisticated techniques of genetic engineering. Their research is directed toward helping the farmer as are other ARS laboratories. Some of the accomplishments are given below:

1. Young corn cells have been changed by using "the gene germ" to transfer genes. Inserting "new" genes into corn has been impossible with other molecular gene transfer methods. The high velocity projectile is successful and this is a milestone achievement. This allows genetic engineering to advance in corn and related species.

2. "Jumping genes" or transposable elements have been successfully used to cause mutations or changes in cells. These changes can serve as "tags" that allow the scientist to observe how the plant grows at the cell and tissue level. These directed changes may allow the scientist to insert desired alterations to improve plants.

3. In collaboration with the Lubbock, Texas, ARS location, the Plant Gene Expression scientists have genetically engineered tobacco plants that are tolerant to high levels of 2,4-D. The same gene system is being transferred to cotton plants which are very sensitive to the 2,4-D herbicide. This will help the farmer in herbicide application and increase production efficiency. The scientists have developed a system of transient assays that specify molecular genetic transformation in 24 hours. The key regulatory enzyme for ethylene biosynthesis has been cloned.

4. Ethylene is a gaseous compound in plants that regulates aging or maturation of fruits. The scientists have cloned the gene that regulates the production of the gas. With this capability, it may be possible to direct ripening of fruits and vegetables to meet marketing needs more effectively than ever before. This would aid U.S. agriculture export posture as well as improve transportation handling procedures in the U.S. Such findings will not only renationalize agricultural productivity in the coming years, but will also help in helping farmers meet increasing public concerns regarding environmental degradation caused by agriculture as well as food safety concerns of American Consumers.

Mr. Whitten. What is the budget for the Center for fiscal years 1989, 1990, and 1991?

Dr. Plowman. The Plant Gene Expression Center budget for 1989 is $3,117,900; for 1990, $3,077,600; and for 1991, $3,007,600.

STAFFING OF RESEARCH FACILITIES

Mr. Whitten. Would you please provide for the record a table indicating, by location, your total laboratory capacity in terms of the number of scientists, indicating the total number of scientists assigned to that facility and the percent staffed?

Dr. Plowman. The laboratory capacity, the number of scientists assigned by location and the percent staffed will be provided for the record.

[The information follows:]

United States Department of Agriculture
Agricultural Research Service

Status of Staffing of Agricultural Research Service Facilities
Locations with Capacity of more than 10 Scientists
As of October 31, 1989

(Expressed in terms of scientific personnel)

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
Alabama:			
Auburn	13	13	100
Arizona:			
Phoenix	41	29	71
Tucson	31	30	97
California:			
Albany	189	172	91
Davis	10	5	50
Fresno	28	27	96
Pasadena	26	23	88
Riverside	26	21	81
Salinas	23	14	61
San Francisco	35	35	100
Shafter	12	9	75
Colorado:			
Akron	10	7	70
Ft. Collins	49	49	100
District of Columbia	27	25	92
Florida:			
Gainesville	62	61	98
Miami	11	9	82
Orlando	30	24	80
Winter Haven	20	10	50
Georgia:			
Athens	134	105	78
Byron	18	15	83
Dawson	14	10	71
Savannah	28	16	57
Tifton	31	29	94
Watkinsville	18	8	44

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
Hawaii:			
Hilo	10	7	70
Honolulu	10	10	100
Idaho:			
Boise	12	12	100
Dubois	11	11	1[illegible]
Kimberly	19	19	100
Illinois:			
Peoria	180	180	100
Indiana:			
W. Lafayette	14	14	100
Iowa:			
Ames	130	86	66
Ames/Ankeny	20	9	45
Kansas:			
Manhattan	47	21	45
Louisiana:			
Baton Rouge	11	11	100
New Orleans	150	123	82
Maryland:			
Beltsville	615	597	97
Frederick	26	19	73
Hyattsville	10	10	100
Massachusetts:			
Boston	50	34	68
Mexico:			
Tuxtla-Gutierrez	10	7	70
Michigan:			
East Lansing	16	13	81
Minnesota:			
Morris	18	18	100
Mississippi:			
Mississippi State	51	51	100
Oxford	25	19	76
Stoneville	61	48	79
Montana:			
Bozeman	11	11	100
Sidney	11	7	64

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
Nebraska:			
Clay Center	67	45	67
New Mexico:			
Las Cruces	15	8	53
New York:			
Ithaca	20	20	100
Plum Island	44	24	55
North Carolina:			
Oxford	16	13	81
Raleigh	24	24	100
North Dakota:			
Fargo	80	71	89
Grand Forks	31	31	100
Mandan	24	19	79
Oklahoma:			
Durant	19	19	100
El Reno	17	9	53
Lane	16	14	88
Stillwater	17	16	94
Woodward	10	6	60
Oregon:			
Corvallis	22	22	100
Pendleton	15	14	93
Pennsylvania:			
University Park	25	19	76
Wyndmoor	150	122	81
Puerto Rico:			
Mayaquez	13	12	92
South Carolina:			
Charleston	13	12	92
Florence	14	8	57
South Dakota:			
Brookings	12	9	75
Texas:			
Bushland	29	16	55
College Station	51	51	100
Houston	58	30	52
Kerrville	23	18	78
Lubbock	19	19	100
Temple	33	25	76
Weslaco	51	40	78

Location	Total Capacity (Scientist)	Total in Use (Scientist)	Percent Staffed
Utah:			
Logan	22	22	100
Washington:			
Pullman	11	5	45
Wenatchee	15	8	53
Yakima	15	12	80
West Virginia:			
Beckley	18	18	100
Kearneysville	24	24	100
Wisconsin:			
Madison	19	16	84
Subtotal, (84 Locations with capacity of 10 or more scientists)..	3,456	2,924	85
All other locations (26 with capacity of less than 10 scientists)..........	150	118	85
Total, Federal Facilities...........	3,606	3,042	85

Number of Non-ARS Scientists included above 331

Number of ARS Scientists included above:

ARS Senior Scientists.................... 2,701

ARS Junior Scientists.................... 341

Total..................................3,042

Number of ARS Scientists in Non-federally-owned/leased facilities (15 locations):

ARS Senior Scientists.................... 406

ARS Junior Scientists.................... 45

Total 451

Number of-ARS Scientists (All facilities) 3,162

Number of Non-ARS Scientists (All facilities) 331

Total, All Scientists 3,493

PASSENGER MOTOR VEHICLES

Mr. WHITTEN. Last year you proposed to replace 70 of your passenger motor vehicles during fiscal year 1990. What are your current plans for replacements in fiscal year 1990?

Dr. PLOWMAN. Our current plans are to replace approximately 70 passenger motor vehicles in fiscal year 1990.

ARS-OWNED AIRCRAFT

Mr. WHITTEN. Please provide for the record a listing of aircraft owned by the Agricultural Research Service, including where the aircraft are located, the types of aircraft and how the aircraft were acquired. Also indicate for the record the number of flying hours for each of these aircraft during fiscal years 1988 and 1989.

[The information follows:]

Location	Type	Method of acquisition	Flying hours	
			Fiscal year 1988	Fiscal year 1989
College Station, Texas	Cessna T188C	Purchase	50	65
College Station, Texas	Cessna P206B	GSA Excess	5	18
College Station, Texas	Cessna U206B	GSA Purchase	2	9
College Station, Texas	Bell Helicopter	GSA Excess	39	80
Weslaco, Texas	Cessna 182J	GSA Excess	73	37
Weslaco, Texas	Cessna TU2060	GSA Excess	81	172
Weslaco, Texas	Aero Commander	GSA Excess	190	153

ARS-OWNED AIRCRAFT

Mr. WHITTEN. Last year you advised the Committee that you planned to acquire an aircraft for pesticide application technology research at Stoneville, Mississippi. Was this aircraft acquired, and if so, how was it acquired?

Dr. PLOWMAN. The pesticide application technology research at Stoneville has not developed to the point where a Federally owned aircraft is needed. Current research needs can be handled by contracting with private aerial applicators in the area.

Mr. WHITTEN. Has the excess aircraft that was located at College Station, Texas been disposed of, and if so, how?

Dr. PLOWMAN. The 1967 Cessna Model P206B which was declared excess last year has been used during the past year for towing insect sampling nets for insect migration research. The aircraft also serves as a backup for other aircraft at College Station.

BUILDINGS AND FACILITIES

NATIONAL SEED STORAGE LABORATORY

Mr. WHITTEN. To date Congress has provided $9,250,000 for the National Seed Storage Laboratory at Fort Collins, Colorado. Was this facility not proposed as costing $10,000,000?

Dr. PLOWMAN. The actual construction cost, exclusive of planning and design and other services was originally estimated to be

$10,000,000 based on the initial project schedule. However, only $2,750,000 was appropriated for construction in FY 1989. An additional $8,750,000 was requested in FY 1990; however, only $5,500,000 was appropriated. Since the full appropriation of $10,000,000 was not received in FY 1989, the project cost has escalated to $11.1 million.

Mr. **WHITTEN**. Does the current estimate of $13,250,000 include any movable equipment or furnishings for this facility?

Dr. **PLOWMAN**. The current cost of $13,250,000 does not include movable equipment or furnishings for the facility. The current cost of $13,250,000 includes $11.1 million for construction (brick and mortar), $1,150,000 for A-E inspection and construction contingency, and $1.0 million for planning and design (appropriated in FY 1988).

Mr. **WHITTEN**. Does the estimate include any landscaping?

Dr. **PLOWMAN**. The estimate provides for minimal landscaping immediately adjacent to the new building.

ATHENS, GEORGIA

Mr. **WHITTEN**. You are requesting $2,500,000 for a poultry disease laboratory at Athens, Georgia. Has the planning been completed on this facility?

Dr. **PLOWMAN**. Preliminary in-house planning has concluded that a facility addition of approximately 10,000 square feet is required for research on hazardous poultry pathogens. The Agency has not contracted with an architect-engineering firm for definitive details. Funding has not been appropriated for planning and design.

BELTSVILLE

Mr. **WHITTEN**. You are requesting $16,000,000 for Beltsville. On page 7-33 you state that the top priority for work at Beltsville is upgrading and replacing infrastructure such as sewer, water, power, steam, and roads. However, according to pages 7-34 and 7-35, the additional funds are going to be used to study and design new laboratories and greenhouses. Why are you varying from your own priorities?

Dr. **PLOWMAN**. In FY-88 the Agency awarded a contract for a detailed study of Beltsville modernization needs. The results of this study indicated that the Agency should embark on an overall upgrade strategy which includes a mixture of infrastructure repair, existing building repair, and new construction. The consultant is in the process of finalizing a 13-year sequencing design and construction plan which recommends the order of facility upgrade implementation. One or more major new facilities are required to accommodate sequencing and program clustering. The requested $16 million in FY 1991 will be allocated as follows: Design of new construction, $1.8 million; Infrastructure upgrade, $7.4 million; and Existing building repair, $6.8 million for a total of $16.0 million.

The priorities at this time are still infrastructure and existing building repair. It is also critical to begin the process of designing new buildings for the overall BARC modernization projects.

YAKIMA VEGETABLE LABORATORY

Mr. **Whitten**. According to the explanatory notes, you plan to relocate the Yakima facility to a new location. Should this occur, what would happen to the buildings on the nine acre lease site? Would they have any value? Are any of these facilities movable?

Dr. **Plowman**. There are approximately 37 buildings on the 9-acre lease site. The two main buildings—a 24,000 square foot office/laboratory and a 5,000 square foot garage—are owned by the lessor. The other buildings, totaling approximately 23,000 square feet of space, were constructed by ARS in the 1960's and 1970's. The inventory value of the buildings (which does not reflect accumulated depreciation) is $225,000. Fair market value would be considerably less. Upon relocation, we will work with the lessor on appropriate disposition of the ARS-owned buildings which may include removal of all or a portion of the ARS constructed facilities.

NATIONAL ARBORETUM

Mr. **Whitten**. What is the current status of the construction project at the entrance of the National Arboretum?

Dr. **Plowman**. The project is currently under design, and completion is scheduled in the third quarter of FY 1990. Construction will be awarded in the fourth quarter of FY 1990 with completion in late FY 1991.

Mr. **Whitten**. How will the $2,000,000 in funds from the Plum Island judgement be used at the entrance?

Dr. **Plowman**. The funding will be used for the demolition of the existing New York Avenue entrance, construction of a new monumental entrance including gates, fencing, and pylons from Fort Totten and parking provisions for visitors. The brickyard area will have to undergo a hazardous waste cleanup assessment in view of the discovery of asbestos and petroleum product contaminants. This will take 6 to 9 months.

Mr. **Whitten**. The fiscal year 1990 bill language provides that funds recovered from Plum Island may be used to consolidate research and operations at the Plum Island Center and for renovation of Beltsville. Under what authority was the $2,000,000 made available to the National Arboretum?

Dr. **Plowman**. The National Arboretum is considered part of the Beltsville Agricultural Research Center. The FY 1989 Senate Committee Report Number 100-389 provided further guidance to the Agency.

[The report follows:]

PLUM ISLAND ANIMAL DISEASE CENTER

The Committee recommends bill language to allow the use of recovered funds for planned facility changes at the Plum Island Disease Center. These funds will enable the Agricultural Research Service and the Animal and Plant Health Inspection Service to consolidate their research, operational, and administrative activities. The objective of the consolidated activities is to improve overall program performance and reduce operating costs. To the extent possible, partially completed facilities should be salvaged so that the cost of proposed facility changes should not exceed $9,000,000.

The remaining balance of recovered funds should be used for the renovation of the Beltsville Agricultural Research Center, including the National Arboretum. The Committee is aware that improvements need to be made at the New York Avenue entrance into the National Arboretum and encourage the establishment of a site with adequate paring that would attract visitors to this national treasure of plantings. Entrance improvements should not exceed $2,000,000. The Committee notes that this provision could make up to $17,000,000 available in all and $8,000,000 for Beltsville.

WESTERN HUMAN NUTRITION RESEARCH CENTER

Mr. WHITTEN. Please inform the Committee about the current and long-term program plans for the Western Human Nutrition Research Center at the Letterman Army Institute of Research on the Presidio. What is the possibility of continued short- and long-term use of the LAIR facility? What is the Agency's position regarding relocating the facility?

Dr. PLOWMAN. The Western Human Nutrition Research Center located at the Letterman Army Institute of Research, presently consists of 15 scientists and a total of 80 people engaged in studies on human nutritional requirements, development of improved methods for monitoring and evaluating nutritional status and reduction of risk factors for diet-related disorders in which human volunteers and animal models are used. The WHNRC is in need of additional space for its operations. The projected full program would house 40 scientists and about 300 people. The WHNRC can remain at its present location during the next 3 years, at which time present plans are for the Army to vacate LAIR. Meanwhile, as the Army vacates space at LAIR, WHNRC can expand, provided funds are available to meet additional costs.

The LAIR facility can provide all of the future space needs of WHNRC and would avoid costs of building plans, construction, and loss of productivity with relocation. The LAIR complex was originally designed to support a strong nutrition research program and is ideally located in a large metropolitan area on the West Coast. However, LAIR property will be transferred to the Golden Gate National Recreation Area when the Army vacates the property, and GGNRA will determine the future occupancy of the laboratory facility.

The ARS position is to exert every effort to keep the WHNRC at the LAIR facility.

PLUM ISLAND ANIMAL DISEASE CENTER

Mr. WHITTEN. Please outline for the Committee the current status of the planned consolidation of facilities project at the USDA Plum Island Animal Disease Center. Also, what efforts are underway to develop a long-range plan for the repair and maintenance of the facility?

[The information follows:]

A. *Background.*—The USDA's Plum Island Animal Disease Center (PIADC) is located on a Federally-owned island approximately two miles off the eastern tip of Long Island, New York.

The primary function of PIADC is to conduct research on animal diseases that do not exist in the United States, but pose a continuing threat to the U.S. livestock and poultry industries. Congress has mandated that research on certain exotic diseases be performed off the U.S. mainland.

B. *Mission.*—The overall mission of the Center is to protect the U.S. animal industry and our exports from economic losses caused by foreign animal diseases.

The Agricultural Research Service (ARS) mission is to develop new technologies to prevent the outbreak of foreign animal diseases in the U.S. Examples of diseases studied are—African Swine Fever, Foot-and-Mouth-Disease, and Hog Cholera. Other research is aimed at developing molecular vaccines, anti-viral drugs and disease resistant animals.

The Animal and Plant Health Inspection Service (APHIS) mission at PIADC is to perform responsibilities for the diagnosis of foreign animal diseases, including reagent preparation, methods evaluation or adaptation, training in methods for animal disease diagnosis, and other related services.

C. *Status of Consolidation Construction.*—Several years ago, ARS embarked on a plan to upgrade facilities at the Plum Island Animal Disease Center through a combination of renovation and new construction. FY 1976 Congress appropriated funds for the renovation and construction of laboratories that would satisfy ARS and APHIS requirements. A number of problems arose during the construction, and in FY 1979 the contractor was placed in default which led to legal action and the eventual recovery of over $13.6 million. Since 1985 attention has been focused on developing a consolidated ARS/APHIS facility which would meet the needs of both agencies in the most efficient possible manner. In June 1989 the Department advised the Congress that detailed planning for the consolidation would proceed and that the Committee would be kept fully informed.

The FY 1989 Appropriations Act authorized that funds recovered in the judgment against the contractor could be used for the planned consolidation construction. The report language accompanying this action specified that the cost of proposed facilities should not exceed $9 million. In the process of developing the detailed plan to implement the consolidation it has become apparent that biosecurity safeguards and space requirements of the two agencies not previously considered had to be provided in the new structure. After adding the required minimum biocontainment features into the space being renovated for the Foreign Animal Disease Diagnostic Laboratory, the consolidated construction project is now estimated to cost $18 million.

D. *Financing of Consolidation/Construction.*—The two agencies plan to share the consolidation/construction project cost and will continue to work closely with the Committee on this matter.

E. *Additional requirements.*—In 1989 ARS and APHIS initiated an effort to develop a long-range plan for the repair and maintenance of the facilities. An architectural and engineering firm has been commissioned to develop a Facilities Deficiency Plan which will identify immediate and long-term needs along with costs, which can be used for planning and budgetary purposes. The plan will consider needs covering all the facilities, major equipment, utility systems, and infrastructure changes required to bring the Plum Island facility up to a responsible degree of sophistication. Examples of obvious needs already identified are:

(a) Renovation of the Orient Point, Long Island, office and dock area including reconstruction of pier and replacement of bulkhead material.

(b) Replacement of marine vessels providing passenger and cargo services to the Island.

(c) Renovation of dock area and guardhouse at Plum Island including bulkhead removal and replacement.

(d) Installation of electrical self-generation capacity, fuel line renovation and replacement of underground fuel tanks.

(e) Additional waste disposal capability including replacement of existing landfill.

(f) Improved animal holding facilities.

(g) Additional safety equipment including security barriers, fire detection/sprinkler/special control equipment and fire truck.

(h) Continuing and substantial commitment for repair and maintenance to steam lines, sewers, water pipes, electrical service, air filtration, and other support systems including all weather roads are required.

When completed, the Deficiency Study will be used by both agencies to establish priorities and the sequencing of work for future fiscal years. ARS and APHIS plan to share the repair and maintenance costs of the joint use facilities. Obviously, funding needs at Plum Island will have to compete in future years with the needs of other important programs.

PLANT GENOME MAPPING PROGRAM

Mr. WHITTEN. The ARS Plant Genome Mapping Program can be a very costly long-term undertaking and there needs to be a sound understanding concerning the breadth and scope of the science involved and how the program will be managed. Please provide the Committee with your long-term plan and specify objectives, achievements, and milestones for program achievement. Also, provide the incremental financial requirements to meet your major milestone objectives.

[The information follows:]

The long-term plans with objectives, achievements, and milestones in conjunction with the budget are given below:

Goal Statement.—The goal of the USDA Plant Genome Mapping Project is to address concerns about the environment (for example, global changes and water quality) and to promote stability and profitability of production, improved quality of food/fiber/feed, maintenance of germplasm resources, and development of new crop plants and forest species. To accomplish this goal, the Plant Genome Mapping Project will foster and coordinate research leading to the ability to identify, characterize, alter, and rapidly and precisely manipulate genes that specify underlying traits of agricultural importance to meet society's needs. Findings, describing through sequencing, and transfer of important genes are crucial for the effective exploitation of genetic resources. This gene information is required to advance agricultural biotechnology from the USDA Germplasm Program through gene specification and ultimately product release. This goal recognizes that fact that agriculture is an industry based on growing plants for food, feed, fiber, and biomass for ever-changing market place niches and human needs.

Two major objectives were identified for the Plant Genome Mapping Program: (1) mapping of the plant genomes and identification, sequencing, and expression of genes of agricultural importance, and gene transfer technology; and (2) management of data, information, and resources.

Achievements.—The Plant Genome Mapping Program goals will be met by the research of awardees through open competition for multidisciplinary grants from the scientific community. The grants will specify targets, such as mapping levels, sequencing intensities, gene systems to be addressed. Their results will be tracked and evaluated on the basis of science performed and specified targets met on an annual basis.

The multidisciplinary groups will consist of breeders/ geneticists, molecular geneticists, plant physiologists/ biochemists and information persons.

Objective 1.—The broad restriction fragment length polymorphism mapping those species, such as some vegetable crops, forest trees, and others that have little or no mapping information, will be determined by a panel of peers. Those plants that have considerable mapping data and require intensification of analysis will also be addressed.

Subobjective a.—Construction of broad maps of crop plants—this subobjective will be achieved by using restriction fragment length polymorphism (RFLP) technology. It is a rapid method that allows the scientist to determine rather broad genetic similarities and differences and initiate assignment of DNA fragments on the chromosomes and thus begin the mapping process.

Subobjective b.—Detailed mapping of chromosomes and specific gene regions of the DNA, characterization and technology improvement—regions of the chromosome and particularly gene locations will be mapped and intensely probed. Gene regions will be located and the DNA components related to desired genes will be removed from the chromosome and sequenced. Examples of genes/gene systems are those genes that are relevant to agriculture such as resistance to disease and insects, salinity and drought tolerance, and increased vigor. Confirmation of the veracity of transferred genes and their expression will be addressed by physiologists/ biochemists in association with the breeding and geneticists. Lack of desired expression will be, in most cases, a result of abnormal metabolism directed by incorrect gene constructs.

The USDA genome research project will maintain close contact with technology developments with the human genome projects in order to avoid duplication of efforts and utilize advances as rapidly as possible. New technologies will also be developed by the USDA effort. Some of the new technologies that must be developed are automation of laboratory procedures, robotic reading and handling of laboratory results, and developing DNA probing methods without the use of radioactive tracer technology. These approaches will reduce cost and increase processing safety.

Objective 2.—Database and resource management—the plant genome research effort will serve as a clearinghouse for the information pertinent to plant genome mapping research including databases, genetic resource material, research activities, meetings, and publications. Scientists will be able to rapidly obtain desired information electronically through the Office of Plant Genome Mapping in conjunction through the computerized referral systems.

Grants and contracts will be awarded to the tripartite scientific community previously specified. The grant proposals and contracts will request the development and demonstration of networking other genome related databases as well as integration capabilities of various plant databases. Integration will be encouraged from the genetic resource repositories, Germplasm Resources Information Network (GRIN), DNA sequences, DNA probes, proteins, amino acids, promoters, through released lines. This capability of complete integration is not available to scientists and is needed for efficient and effective information exchange.

Budget.—An effective USDA effort in the area of Plant Genome Mapping will require an estimated $250 million of new monies appropriated over a 10 year period. In FY 1991, $18.7 million is being requested for the following purposes: $14.0 million for gene mapping and gene location and transfer of both broad and dense restriction fragment lengths polymorphism (RFLP); $3.0 million for needed database/information; and $1.7 million for genome management and operations. An average of $25 million in incremental funding each year, beginning in FY 1992 through FY 2000 will be used to further strengthen various projects and program goals under the two basic program categories: Gene mapping, Location and Transfer (70% of total) and Database Management and Integration (30% of total).

The challenge of addressing at least 40 important genetic traits, such as disease resistance and drought, heat, and salinity tolerance can be met and explained at the chromosome and molecular levels through multidisciplinary grants. There are more important traits that need to be determined; however, the findings derived from this activity will allow translation and application across many of those hundreds because of the conservativeness of plant DNA. Advances in technological aspects of automation, robotics, and innovative laboratory methodologies will be partly the responsibilities of this effort. Recording these advances involves the establishment of an information system.

The proposed budget allocation for databases will be used to develop software for integrating and networking across repositories of genetic stocks, DNA sequences, proteins, promoters, amino acids formed in academia, industry, and government activites.

The budget for the genome office will be a line item for ARS. The director with five professionals and support staff will manage the genome office. The CSRS will also be involved in the planning process. Responsibilities of the office are developing proposal descriptions, panel selection for grant reviews, establish and run meetings, and coordinate plant gene mapping and information activities.

PLANT GENOME MAPPING

Mr. WHITTEN. Specify how the Plant Genome Mapping Program plans to interface with related programs administered by the National Science Foundation, National Institutes of Health, and other Federally-sponsored programs? Explain how the USDA Plant Genome Mapping Program is different from the Human Genome Mapping Program?

Dr. PLOWMAN. This activity will be coordinated through representation of USDA scientists and liaison people on committees of the Department of Energy, National Institutes of Health, and National Science Foundation—all of which are involved in federally sponsored genome programs. Committee members will also serve on the Plant Genome Research Science and Technology Committee. The mapping technology is already being performed with human and plant genomes. Exchange of technical information and procedures is being done between the two programs. The USDA's program is different from the human genome programs because plants offer opportunities to work with larger populations necessary to address population genetics problems. The life cycles of many plants are shorter than human reproduction and aging stages. Plants have a multitude of genomic structures not found in humans such as polyploidy, aneuploidy, and other chromosonal configurations that can be reproduced at will. Plant genome studies and related genetic engineering research offer reduced objection of public acceptance over dealing with human subjects.

Mr. WHITTEN. Clarify the responsibilities and functions between the ARS Plant Genome Mapping Program and the existing Plant Genetics and Molecular Biology Program administered by the Competitive Grants Program within ARS. What overlap exists in these two programs?

Dr. PLOWMAN. There is no duplication. The FY 1991 budget which proposes the establishment of the National Research Initiative of which the plant genome program is a part, also proposes the termination of the USDA competitive research grants program as we now know it. The plant genome mapping part of the Initiative will be administered by ARS and the remainder of the Initiative will be administered by CSRS. All Initiative projects will be competitively selected with awards based upon peer reviews. However, plant genome mapping projects will be highly targeted toward specific research and gene mapping goals and deliverable research results e.g., location of gene systems advantageous to agriculture or products defined by program managers. Whereas projects within the plant genetic/molecular biology portions of the Research Initiative will continue to be broadly favored on fundamental areas of genetic principles. The existing administrative support office which handles all business aspects of the current USDA grants program will continue to provide support for both the new plant genome program and the remainder of the Research Initiative program.

PLANT STRESS AND WATER CONSERVATION LABORATORY, LUBBOCK, TX

Mr. WHITTEN. The FY 1990 Appropriations Act provided $500,000 for construction at the Plant Stress and Water Conservation Laboratory in Texas. How will these funds be used?

Dr. PLOWMAN. ARS intends to build a headhouse/greenhouse with this funding.

Mr. WHITTEN. During hearings last year, there was a discussion about reducing the scope of the Plant Stress facility. Provide the Committee with an update on this proposal. What is the status of planning and designing the less costly facility as proposed? What needs to be done to move this facility forward? Can program requirements be satisfied by the facility now planned?

Dr. PLOWMAN. In view of the demonstrated successful program operations at the Soil Tilth Laboratory in Ames, Iowa, the Agency wants to adapt this design concept to Lubbock. This is approximately 20,000 square feet less than earlier planning. Master planning of the proposed lease site for utilities and facility placement should be completed by the fourth quarter of FY 1990 presuming that a lease agreement is signed by ARS and Texas Tech in April 1990. A contract for an engineering study to determine the feasibillity and cost of adapting the plans and specifications for the recently completed Soil Tilth Laboratory in Ames, Iowa, to a new site for a Plant Stress Laboratory in Lubbock, Texas, should also be complete by the fourth quarter of FY 1990.

FRESNO, CALIFORNIA

Mr. **Whitten**. In several Appropriations Bills the Committee included language allowing for the purchase of land in order to relocate the Fresno Lab because of the loss of the space at the Fresno airport. Was the authority in the bill used?

Dr. **Plowman**. Pursuant to Public Law No. 99-591, dated October 30, 1986, we acquired 30 acres of land in Fresno at a cost of $800,000. No additional land was needed. Therefore, the authority continued in the fiscal year 1989 bill was not exercised.

Mr. **Whitten**. Congressman Richard Lehman has asked that we inquire about the Fresno facility. What are the current research projects underway and what type of facilities are located at Fresno?

Dr. **Plowman**. The Agricultural Research Service facility at Fresno, California performs research on the control of and quarantine treatments on insect pests of horticultural crops, stone and citrus fruit and nuts. Research is conducted on quality and post harvest losses of stone and citrus fruit and horticultural crops; and germplasm research on stone fruit. Irrigation and drainage research is directed toward reduction of water pollution and the control of salts and potentially toxic elements.

The facilities consist of concrete block buildings constructed in the late 1920's through the Works Progress Administration and house-trailer complexes constructed over the last 10 years. The overall facility is in need of modernization to bring it up to present day laboratory standards. Existing permanent and temporary facilities are not energy efficient with annual utility costs for the Location totaling $128,000. Shop facilities are leased off-location under an annual agreement with City of Fresno. The city has advised that at some future time they will need this space for airport needs. Incompatible research projects cannot be sufficiently isolated due to limited facilities.

Mr. **Whitten**. What percent of the staff are located in temporary trailers?

Dr. **Plowman**. The staff located in the house-trailer complexes comprises 78 percent of the location employees.

Mr. **Whitten**. What plans are under consideration with respect to permanent facilities at Fresno?

Dr. **Plowman**. In 1987, 30 acres of land were purchased by ARS in support of the location's research program. Five acres of the 30-acre parcel were set aside for a new facility complex.

Other higher facility construction priorities have precluded an Agency budget request for A-E planning, design, and construction funding.

Mr. **Whitten**. What would be the estimated cost of a permanent facility at Fresno? What size staff would be located there and what would the requirement be for land, greenhouses, etc.?

Dr. **Plowman**. No planning has been undertaken that would provide an accurate dollar amount for construction of this facility at this time. The SY capacity would be 30. The 30 acres of land purchased in 1987 is sufficient. The laboratory complex will consist of a new office/laboratory facility, greenhouse and headhouse structures, a farm equipment storage building, and germ plasm testing facilities.

Mr. **Whitten**. Mrs. Smith?

NATIONAL RESEARCH INITIATIVE

Mrs. **Smith**. Thank you, Mr. Whitten, and welcome.

As the chairman said, you are well aware that this committee is very supportive of research, and we recognize the importance of what you do. I am familiar, Dr. Hess and Dr. Plowman, with the President's proposed $100 million national research initiative.

As well, I appreciate the Administration's commitment to $50 million annually if Congress goes along with it. However, would you explain to the committee whether this is a repackaging or is this a new program? I am concerned about the competing grant process also with the universities.

Dr. **Hess**. As I have described, we recognize that the budget does not include all of the special grants that were in the 1990 budget, however, we have been able to increase the special grants from zero three years ago to $5 million two years ago to $15 million last year.

This year, we have included $25.6 million of special grants, areas that Congress has indicated an interest in. This is in part recognizing the importance of this type of grant. What we have proposed is to essentially double the existing competitive grants program, which would then raise the amount of funding that we have in competitive grants to about 8 percent of our budget.

We feel that would be a balanced portfolio of grant support. We have the formula funding that goes to land grant universities, base funding that goes to Agricultural Research Service, and we feel with 8 percent, we can help attract the best minds, also to attract our scientists in land grant universities to do agriculturally relevant work.

One of the things that was happening is because of the grants program, which are larger in the National Science Foundation, the National Institutes of Health, is that some of our scientists are going for those grants and not for agriculture grants.

IMPORTANCE OF NATIONAL RESEARCH INITIATIVE

This initiative will enable us to increase the size of our grant and get our faculty and our scientists to work on agriculturally relevant issues, to bring them back to agriculture priorities. Anyway, those are some of the reasons.

The other thing is that we are able to focus on major areas of concern to U.S. agriculture; that is improved plants, improved efficiency, so they can be more competitive and disease-resistant so we can have less dependency on chemicals.

We would like to work on the area of nutrition. It is such a key interest in people's minds. I think agriculture has a key role in terms of diet and health relationships. And food safety, of course, is an issue in the headlines this year.

We are able to provide focus with the competitive grants program, and it provides a balance to our base funding in Hatch to the land grant universities, and base funding to the Agricultural Research Service throughout the United States.

Mrs. SMITH. I appreciate that explanation. You know, we do have to look very carefully at where is the wisest place to put research money. I have just come this morning from the Appropriations Energy and Water Subcommittee. We are debating over there whether it is better for this country to put $10 or $15 billion, we can't find out which, into something called a supercollider down in Texas, or would we be better off to give some technological research transition money to the 60 universities that want to do the work in universities all across the country.

So, all of this is really a very big question. Now, I just want to ask you if you would discuss briefly this national seed laboratory. I understand $4 million more is being requested to initiate construction of new land out there. What difficulties are occurring in the current seed lab, and why is this facility so important?

Dr. HESS. I will let Dr. Plowman answer that.

NATIONAL SEED STORAGE LABORATORY

Dr. PLOWMAN. Okay, the seed laboratory does a couple of things. First of all, it is a repository. For example, when a plant explorer goes to another country and collects plants, germplasm, seeds and whatever, they are deposited there and characterized and made available for anyone else who wants to use it.

In addition to that, any new variety of seed when released in this country must be characterized and placed there on deposit for other people to use.

The laboratory also does work on preservation methods. As it has been in the past, every few years or so we would have to regrow all of these seeds in order to preserve them. So, what we have been doing is working on some cold storage methods so we don't have to do that as often.

The technology is developing in how to preserve seeds over a long period of time. Now, the present facility is full. We can't take any more and the research space is totally inadequate to further develop the kinds of things that we think are possibilities.

So, we either must expand the room somewhere or else we have to say we can't take any new varieties, new germplasm. So that is why it is very important for us.

MEAT ANIMAL RESEARCH CENTER

Mrs. SMITH. Thank you.

Now, I would like to ask three questions about MARC Animal Research Center out in my district. You understand my interests are parochial, and I am very much interested in that. Now, the Nebraska cattlemen and the National Cattlemen are asking USDA and the Congress to provide funding for mapping the genome of cattle at MARC.

Could you tell me how much funding on an annual basis would be required for MARC to undertake this project, and how much money is requested in the President's 1991 budget for genome mapping at MARC?

Dr. PLOWMAN. We think again that like plants, it is time that we get started on a project on animals as well. It will have to be in a place that can handle cattle, as well as having the scientists to do it. We think that MARC is a very appropriate place. We would estimate that it will take about $2 million a year to have an aggressive effort.

In the 1991 budget, we are proposing $625,000 to go towards that project. I should say, too, that the animal mapping program will be very closely tied with what is going on at NIH with the human genome, because I hate to say this, but we probably have about 85 percent of our genes in common with animals.

So it will have to be very closely related to the work going on in the human genome. But, nevertheless, we need to uncover these traits in cattle. We can again move genes around and be more productive with it.

Mrs. SMITH. I appreciate that. Let me tell you, and I am sure you are already aware that the new animal health building at MARC is completed, and the veterinarian scientists are housed in the new building.

We have four scientists out there now, plus support staff, and we are so happy about this expansion. Now, the subcommittee did add some funding last year for staffing the Animal Health Research Program, and I believe you indicated, Dr. Plowman last year, that it would take about $1.8 million for full staffing.

How much funding is available for the animal health research at MARC, and how much is included in the President's 1991 budget?

Dr. PLOWMAN. As you have correctly indicated, we have four people there now. In the 1991 proposal, we are planning to dedicate another $250,000 to that effort, and add another person there.

For full staffing, why, it will take us some years probably to complete that. I hope you have on your calendar April 28 for dedicating that facility.

Mrs. SMITH. I think I have that marked.

Dr. PLOWMAN. I hope you can come and participate with us in that.

Mrs. SMITH. I look forward to that very much. One more question on that, about the swine facilities restoration. Could you comment about the progress and the funding that is in the budget?

Dr. PLOWMAN. On the swine facility, it is planned now to have four small buildings instead of one facility. We will construct those as funds become available. This committee has provided about $430,000 in the last two years to do that.

So we will be moving along and starting construction on one or more of those in this fiscal year.

Mrs. SMITH. Well, I do thank you for that.

FY 1991 BUDGET RECOMMENDATIONS

The ARS budget for FY91 proposes $623.5 million for operations and research, an increase of $37.6 million when compared to the $585.9 million provided in FY90.

In addition, the President's budget proposes to increase ARS construction funding from the FY90 level of $10.7 million to $32.6 million in FY91.

Dr. Hess and Administrator Plowman, would you explain to the subcommittee the reason for this increase? Is this funding level adequate in light of the President's research initiative?

Dr. PLOWMAN. ARS' FY 1991 increases for both programs and facility needs are adequate to meet the agency's research goals and plans in FY 1991. Only $3.7 million of the total proposed increases by ARS in FY 1991 will actually support the National Research Initiative. This is being requested by ARS to allow the agency to take a leadership role in the Plant Genome Mapping Program which is a key component area under the initiative.

AFLATOXIN RESEARCH

Mrs. SMITH. I wish to call attention to the ARS research money provided for aflatoxin research and detection. As you recall, this committee provided roughly $750,000 for this research.

I am aware that this research money was divided between both the Department-ARS and a joint commodity and industry working group on aflatoxin. If additional funds were provided in FY91, would this same 50/50 split be applied?

Dr. PLOWMAN. The proposed ARS budget for 1991 contains $1.6 million for aflatoxin research. These funds will be used to support research strategies targeted to preharvest control of aflatoxin in peanuts, corn, and cottonseed. The research strategies will include breeding resistant crop varieties, biocontrol, the delineation of ecological relationships, and the role of insects. It is proposed that the research will be carried out by ARS facilities at the following five locations: Dawson, Georgia; New Orleans, Louisiana; Peoria, Illinois; Tifton, Georgia; and Mississippi State, Mississippi.

Mrs. SMITH. But before I stop, Dr. Hess and Dr. Plowman, I am also concerned about low-input sustainable agriculture reports. Of course, you are familiar with that research project which has generated a lot of controversy across the country.

The National Academy of Sciences said in a 448-page report last September that it was explaining 13 model farm operations that operated on NAS principles, but already they tell us that three of those 13 are having financial difficulties.

Then, I wanted to tell you, too, that this morning, the six board members of the Nebraska Soybean Association met with me, and the first thing they said was, we want to tell you that one of our board members isn't here because he operated on lease, and he has gone broke. I am not against some research, but I think we want to not put all of our eggs in that basket.

Thank you, Mr. Chairman.

Mr. WHITTEN. Mr. Natcher?

Mr. NATCHER. Thank you, Mr. Chairman.

In your statement, you point out to the committee, and I quote:

> A particular concern is the need to increase the diversity of students in agriculture. Much has been said about these concerns, but it is essential to provide resources to affect a positive change.
>
> Mr. Chairman, I am pleased to submit a budget with increases in most of our higher education programs, including the 1890 capacity building grants program being initiated in 1990 with the support of your committee.

How much increase do you have here?

Dr. **Hess.** Mr. Natcher, if we could defer that question for tomorrow, when the Cooperative State Research Service will appear before you, that will be in their budget.

Mr. **Natcher.** In their section? All right, I will do it.

Mr. Chairman, thank you very much.

Mr. **Whitten.** Mr. Akaka?

Mr. **Akaka.** Thank you very much, Mr. Chairman.

Mr. Secretary and Mr. Administrator and staff people, we are happy to have you here.

Dr. **Hess.** Thank you.

FRUIT FLIES

Mr. **Akaka.** Particularly, I want to speak to Dr. Plowman. It is not common knowledge that while my colleagues were back in their districts in January that Dr. Plowman and I spent some time on the battle lines or on the front lines on the island of Kauai.

Mr. **Myers.** You didn't inform us.

Mr. **Akaka.** I am speaking about the battle against fruit flies. Hawaii has always been known to open its arms to all of its visitors, and they have done so very well with the visitor industry. This is what we call the spirit of aloha.

But there is one major exception to this rule. Since 1895, we have had a visitor in Hawaii that has been unwelcome, has stayed too long and hasn't left since. We are trying to get rid of it.

The unwelcome guest I am speaking of is the fruit fly. In Hawaii, the only aloha we have for fruit flies is the aloha that means goodbye. Well, this January marked the turning point in that battlefield, and in that front line. We declared war on the fruit fly, the medfly, to be exact.

With support provided by this subcommittee, we began a program of sterile fly release on the island of Kauai. Dr. Plowman knows all about this program, because he was there to inaugurate the Kauai sterile fly program. Also there was Deputy Secretary Parnell. We felt honored to have these high-ranking people there to help inaugurate this project.

Dr. Plowman, I have a memento of our trip. I have a photograph of two of us releasing fruit flies at the McBride coffee plantation. I penned a note on a photograph which says, "Dean, thanks for doing your part in the war against fruit flies." It is dated January 12, 1990.

I want you to have this, and I want to pass this on for my colleagues to see it, especially those that didn't make it.

Dr. **Plowman.** Mr. Akaka, I have often said there are no flies on me, but this proves I am wrong. You, too.

Mr. **Akaka.** That is right. I was full of flies. And I think that maybe the facility will help us out. With the arrival of the fruit fly in 1895, there have been a host of problems for Hawaii and maybe for the rest of our country. They infest some 250 different crops and cause so much damage that it becomes economically impossible to grow all but a handful of less susceptible crops.

The project we have begun on Kauai is designed to change all of that. For the benefit of my colleagues who couldn't make the trip, would you share with us your impressions of the Kauai eradication problem, and the prospects for its success?

Dr. PLOWMAN. I would be pleased to do that. After being there and helping to release these sterile flies and learning——

Mr. MYERS. Did you check them to be sure?

Dr. PLOWMAN. We didn't check each one of them out, but I am sure it is true. I am very enthusiastic and optimistic that these flies can be eradicated in Hawaii. We have worked over there for many years developing technology to suppress flies. At the present time, all of this technology is coming together with the sterile male technique, with attractants and baits and now with a predator that we have developed.

I think all of these technologies are coming together, so it will be possible now to eradicate the fruitfly. It is an immense job, but I am still optimistic that we can do it.

With the recent completion of the APHIS laboratory over there, they can produce zillions of sterile flies, whatever a zillion is. And we can distribute them around, and with this technology, and in companionship with the other pieces, I am optimistic we can get that job done.

The project is starting on Kauai, and both of us flew over that island. I had no idea that island was as rugged and inaccessible as it is.

The other thing I was really impressed with is the interest of the people, the agriculture people on the island, who were providing help to get this job done. Everyone is really enthusiastic about doing it. We are optimistic about it can be done.

We have laid out a very ambitious 13-year plan detailing in a whole lot of detail exactly what we would do year by year. Again, if everything falls in place, and we have no doubt that it will, I think at the end of that 13 years, we can look back and we will see eradication of these problems.

Mr. AKAKA. Thank you for your thoughts on that.

In Southern California, the State and Federal Government are battling a medfly infestation across 1,000 square miles. This area is nearly the same size as the 1982 infestation that cost over $100 million to eradicate.

USDA estimates that an estimated fruit fly infestation would result in an annual crop loss in excess of $800 million. Dr. Plowman, many people believe that if we can eradicate fruit flies in Hawaii, we can eradicate them anywhere. How can the success of the Hawaii project be of benefit to other areas of the United States?

Dr. PLOWMAN. Well, I think that dealing in a relatively small area that we can totally control, we will be able to learn if, in fact, we can achieve eradication there. Then these same technologies can be used in a much larger area. I am very optimistic that that can be done.

Mr. AKAKA. Do you believe that work being carried out on Kauai is directly related to the long-term need to improve eradication techniques and at the same time, that we eliminate existing infestations?

Dr. **Plowman**. I think that is true. Although we are calling this a pilot test, the objective is to eradicate the medfly on the island of Kauai.

Mr. **Akaka**. You and I have discussed ways of speeding up the process so that we won't have to wait until after the year 2000 to see eradication of the three species from Kauai and the eradication of the medfly from the island of Oahu.

ERADICATION PLAN

Do you believe that an eradication plan can be developed which would complete this process by fiscal year 1997 rather than the year 2002 under the current plan? And if so, would this new plan cost any more in the long run?

Dr. **Plowman**. We have taken a hard look at that in terms of our present resources, both financial and manpower. Although the plan we have right now shows a 13-year timetable, we could compress that timetable down to eight years. Even the 13-year plan calls for, in the year 1994 or 1995, as we move into the other island, another infusion of $1.8 million.

We think we could compress the total time down to eight years, and it wouldn't cost any more in total. It would just be a different configuration on when the money would be available. So it wouldn't cost any more. It would just be accomplished earlier.

Mr. **Akaka**. I want to reiterate my concern about the importance of identifying the right person to fill the vacancy on our ARS project.

Also, I want to assure you that representatives of the Oceanic Institute are just as anxious as you are to achieve a final agreement on the ARS research agenda. We have chatted with them about some of the discussions we have had.

The President of the institute plans to be in Washington next week. You will probably be hearing from them later today about meeting with you to resolve this issue.

Thank you very much for your response. I want to tell you ARS has done a great job in Hawaii.

Dr. **Plowman**. It is a very high priority for us. We share your concern about a new director of the laboratory since Dr. Gilmore is retiring in April.

That is one of our highest priorities for refilling the position. We will get the very best person that is possible.

KAUAI FRUIT FLY PROJECT

Mr. **Akaka**. The conference report to accompany the FY 1990 appropriations bill contained an appropriation for APHIS which provided $400,000 "for the cost of releasing sterile fruit flies on Kauai."

How could ARS use these funds most effectively in FY 1990?

Dr. **Plowman**. The funds will be used for aircraft contracts (about $225,000), the fly distribution center at Barking Sands ($45,000), supplies and equipment ($90,000), and vehicle maintenance and fuel ($40,000).

Mr. **Akaka**. If these funds were not made available to ARS in FY 1990, what Research activities other than your release program would have to be postponed or curtailed?

Dr. **Plowman**. If the $400,000 were not available to ARS, we would have to shift funds to the Mediterranean fruit fly program by curtailing our Malaysian fruit fly program, especially laboratory and field studies that will lead to a pilot test such as a practical mass rearing system, and information necessary to estimate the number of sterile flies required; and the biological data necessary to determine the most efficient and practical system that would be used as an eradication strategy for the Oriental fruit fly and melon fly.

Mr. **Akaka**. If these funds were not provided to ARS in FY 1990, how would this affect the ARS 8 year and 13 year plan for eradication of the three fruit fly species on Kauai and the Malaysian fruit fly from Oahu?

Dr. **Plowman**. If the $400,000 were not provided, both the 13 and 8 year plans would be affected. With the 13 year-plan, the concern is the possibility that the Malaysian fruit fly would spread beyond the area between Waipahu and Honolulu or even to the other Hawaiian Islands. If so, our program will be more complicated and may require 1 or 2 additional years over our current projection. The 8-year program would also be significantly affected. The research data we hoped to obtain in FY 90 for the Malaysian fruit fly, the Oriental fruit fly, and/or the melon fly may have to be curtailed; the pilot test for the Malaysian fruit fly, and the environmental and biological studies for the melon and Oriental fruit fly projected for FY 91 may have to be delayed 1 to 2 years.

Mr. **Akaka**. Estimate the total costs ARS will incur in FY 1990 in connection with sterile Medfly release on Kauai (e.g., preparation of flies for release, aircraft rental, fuel for ground release, etc.)

Dr. **Plowman**. The estimated total costs for the Kauai/Niihau pilot test, excluding local overhead cost, will be provided for the record.

[The information follows:]

Kauai Fruit Fly Project

[In thousands of dollars]

Salaries (professionals and non-professional)	$596
Cooperative agreement with University of Hawaii	217
Barking Sands (fly holding and distribution site)	110
Supplies and Equipment	136
Vehicles	190
Aircraft contract costs	225
Inter-island travel and per diem	26
Total cost	1,500

Mr. **Akaka**. What is the current ARS rearing capacity in Hawaii and what is the optimum rearing capacity ARS will need based upon the 8 year eradication plan?

Dr. **Plowman**. The current maximum ARS rearing capacity for the Mediterranean fruit fly is about 18 million per week including experimental strains. We also can produce about 500,000 parasites per week. An optimum rearing capacity for an 8-year plan is to produce about 50 million flies per week for each of 2 species of fruit flies in any given year. In addition, a separate rearing facility with a capacity of 10–15 million Oriental fruit fly and melon fly parasites per week would be needed.

Mr. AKAKA. Using an outline form, describe the current 13 year plan for eradicating the three species of fruit flies from Kauai as well as the Malaysian fruit fly from Oahu. Also provide an accelerated eradication plan under which the pilot tests would be completed in 8 years. Use tables and time lines to describe sequential and concurrent activities of the fruit fly pilot test and provide cost estimates, by year and species, for both the 13 year and 8 year plans.

[The information follows:]

The following describes a 13 year and an 8 year pilot test plan for the Mediterranean and Oriental fruit flies, and the melon fly from Kauai/Niihau, and all the Malaysian fruit flies from Oahu in outline form. The tables show the time frame and cost by fiscal year and fruit fly species.

Summary: 1. Our current 13-year plan was initiated in FY 1990 and will be completed in FY 2002.

a. Although the annual cost of the pilot test will increase over the years additional appropriations will not be required because funds will be shifted to the pilot test from the core program in fruit fly research. Funds are adequate through FY 96.

b. An appropriation increase of $0.9 million is required in FY 97 and another of $0.5 million is required in FY 99.

c. The total estimated cost is $31.5 million.

2. The accelerated 8-year plan would be completed in FY 1997.

a. An appropriation increase of $1.8 million is required in FY 1991.

b. The total estimated cost is $31.5 million.

3. There is no difference in total accumulative cost between the 13-year plan and the 8-year plan.

Table 1: Pilot tests would be completed in 13 years.

Medfly in FY 1992.

Malaysian fruit fly in FY 1995 (eradication may be achieved for all of Hawaii because population now limited from Honolulu to Waipahu).

Oriental fruit fly in FY 1999.

Melon fly in FY 2002.

Table 2: Pilot tests be completed in 8 years.

Medfly in FY 1992.

Malaysian fruit fly in FY 1993.

Oriental fruit fly in FY 1997.

Melon fly in FY 1997.

Table 3: Estimated total cost for the 13-year program is $31.5 million.

Appropriation increases are required in FY 1997 ($0.9 million) and FY 1999 ($0.5 million).

Assumes pass-through from APHIS of $400,000 per annum and 50 million flies per week will continue until FY 2002.

Other research and operating costs include vehicle repair, maintenance, and purchases; research necessary to improve efficiency of eradication programs; and research support for APHIS programs.

Table 4: Estimated total cost for the accelerated 8-year program is $31.5 million.

Appropriation increases are required in FY 1991 ($1.8 million), FY 1992 ($0.3 million), FY 1994 ($1.0 million) and FY 1996 ($1.1 million).

Assumes pass-through from APHIS of dollars and flies would continue until FY 1997.

Table 1. Current Program (13 years): Time frame in Fiscal Year to complete pilot tests for Trifly[a] on Kauai/Niiahu and Malaysian fruit fly[b] on Oahu by species[c].

Pilot Test by Pest Species	Fiscal Year ($Millions)												
	90	91	92	93	94	95	96	97	98	99	00	01	02, etc.
1. Medfly Kauai/Niihau	Pilot test			eradication on remainder of Hawaiian Islands possible									
2. Oriental fruit fly Kauai/Niihau				Environmental and parasite studies			Pilot test			eradication on remainder of Hawaiian Islands possible			
3. Melon fly Kauai/Niihau				Environmental and parasite studies			------------				Pilot test		erad. on remainder of HI Is. possible
4. Malaysian fruit fly Oahu				Pilot test									

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[a] Trifly refers to Mediterranean and Oriental fruit flies, and the melon fly. They occur on all islands.
[b] The Malaysian fruit fly is limited to the Island of Oahu.
[c] Assumes dollars, facilities and equipment, and personnel would be available when required, and environmental issues are resolved on a timely basis.

Table 2. Accelerated Program (8 years): Time frame in fiscal year to complete pilot tests for Trifly on Kauai/Niiahu and Malaysian fruit fly on Oahu by species[a].

Pilot Test by Pest Species	Fiscal Year ($Millions) 90	91	92	93	94	95	96	97	98	99	00	01	02,	etc.
1. Medfly Kauai/Niihau	Pilot test			eradication on remainder of Hawaiian Islands possible										
2. Oriental fruit fly Kauai/Niihau		Environmental and parasite studies		Pilot test					eradication on remainder of Hawaiian Islands possible					
3. Melon fly Kauai/Niihau		Environmental and parasite studies		Pilot test					eradication on remainder of Hawaiian Islands possible					
4. Malaysian fruit fly Oahu		Pilot test												

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[a] Assumes dollars, facilities and equipment, and personnel available when required, and environmental issues are resolved on a timely basis.

Table 3. Current Program (13 years): Estimated Dollars (millions) at appropriated level required to complete pilot test for Trifly eradication on Kauai/Niihau and Malaysian fruit fly on Oahu in indicated timeframe.

Pest Species	Fiscal Year ($ millions)												
	90	91	92	93	94	95	96	97	98	99	00	01	02
Medfly													
Pilot test	1.5	1.7	1.9										
Oriental fruit fly													
a. Environmental and parasite studies[a]	---	---	---	0.6	0.6	0.6	0.6	---	---	---			
b. Pilot test	---	---	---	---	---	---	---	2.8	2.8	3.3			
Melon fly													
a. Environmental and parasite studies[a]	---	---	---	Dollars included in "a" above				---	---	---	---	---	---
b. Pilot test	---	---	---	---	---	---	---	---	---	---	2.2	2.2	2.8
Malaysian fruit fly													
a. prepilot test	---	---	---	0.9	---	---							
b. pilot test	---	---	---	---	1.0	1.1							
Other research and operating costs	0	0	0	0.4	0.3	0.2	1.3	0	0	0	1.1	1.1	0.5
Total cost	1.5	1.7	1.9	1.9	1.9	1.9	1.9	2.8	2.8	3.3	3.3	3.3	3.3
1. Total in base[b]	1.5	1.7	1.9	1.9	1.9	1.9	1.9	1.9	2.8	2.8	3.3	3.3	3.3
2. Estimated budget increases required	0	0	0	0	0	0	0	0.9	0	0.5	0	0	0
3. Estimated total approp. costs[c]	1.5	1.7	1.9	1.9	1.9	1.9	1.9	2.8	2.8	3.3	3.3	3.3	3.3 = 31.5

[a] Oriental fruit fly and melon fly studies conducted simultaneously.

[b] Pilot Test base plus increase, if any, from previous years. In FY 91 and 92 funds will be reprogrammed to the Pilot Test base from the base program in fruitfly research. The pass-through of $400,000 and 50 million sterile flies each week from APHIS is included and assumes the dollars and flies will continue to be transferred until all pilot tests are completed.

[c] Assumes all budget increases required as indicated will be appropriated.

Kauai Fruit Fly Project

Table 4. Accelerated Program (8 years): Estimated appropriated dollars required to complete pilot tests for Trifly eradication on Kauai/Niihau and Malaysian fruit fly on Oahu in indicated timeframe.

Pest Species	Fiscal Year ($ million) 90	91	92	93	94	95	96	97
Medfly								
Pilot test	1.5	1.7	1.9	eradication on remainder of Hawaiian Is. possible				
Oriental fruit fly								
a. Environmental and parasite studies	—	1.1	1.1	1.3	---	---	---	---
b. Pilot test	—	—	—	—	2.8	2.8	3.3	1.1
Melon fly								
a. Environmental and parasite studies	—	Dollars included with oriental fruit fly		---		---	---	---
b. Pilot test	—	—	—	—	2.2	2.2	2.8	1.1
Malaysian fruit fly								
Pilot test	—	0.9	1.0	1.1	---	---	---	---
Other research and operating costs	0	0	0	1.6	0	0	0	0
Total cost	1.5	3.7	4.0	4.0	5.0	5.0	6.1	2.2
1. Total in base[a/]	1.5	1.9[b/]	3.7	4.0	4.0	5.0	5.0	2.2[c/]
2. Estimated increase required	0	1.8	0.3	0	1.0	0	1.1	0
3. Estimated total appropriated cost[d/]	1.5	3.7	4.0	4.0	5.0	5.0	6.1	2.2 = $31.5

a/ Base plus increase if any from previous year. Also includes the pass-through of $400,000 and 50 million sterile flies per week from APHIS, and assumes the dollars and flies will continue until all pilot tests are completed.

b/ Shift of $400,000 from other fruit fly programs.

c/ Part of base from FY '96 ($3.9 million) would be shifted out of pilot test projects.

d/ Assumes all budget increases required will be appropriated.

Mr. AKAKA. Compare the total cost of the 13 year and 8 year pilot programs.

Dr. PLOWMAN. The estimated total cost for the 13 year and 8 year pilot programs are the same; $31.5 million; only the distribution of funding need by year is different.

NEW PRODUCTS FROM SUGARCANE

Mr. **Akaka**. Dr. Plowman, identify the structural advantages of sucrose molecule which permit it to be exploited for the development of polymers or other nonagricultural uses.

Dr. **Plowman**. The presence of hydroxyl groups in the structure of the sucrose molecule permits esterification reactions. Fatty acid esters can be made and serve as fat substitutes in novel food products. Also, the use of sucrose as a substrate in fermentation systems with specialized microorganisms can lead to the production of biopolymers with a wide range of industrial applications.

Mr. **Akaka**. Dr. Plowman, given the historic world oversupply of sugar, what are the advantages of research on new products from sucrose?

Dr. **Plowman**. Sucrose can be fermented readily to give a range of specialty products of potential market importance. For example, recent ARS research on sucrose fermentation has produced biopolymers of commercial interest. Work is continuing to improve the technology so as to reduce costs of production of these products. This research will benefit the sugar industry.

Mr. **Akaka**. Dr. Plowman, in fiscal year 1990, Congress made an additional $218,000 available to address the needs of the Hawaiian sugar industry including the development of new products from sugarcane. How will those funds be administered and what work will be performed in fiscal year 1990 under this activity?

Dr. **Plowman**. These funds are being used for an expansion of cooperative research with the Hawaiian Sugar Planters' Association. Emphasis will be on use of biotechnology to increase production efficiency and yield of sugarcane; a better understanding of the physiological and biochemical processes that regulate sugar synthesis and transport at the molecular, cellular, and whole plant level; production of sugarcane hybrids which will maintain high sugar yields but with increased plant fiber, and new products. High fiber hybrids would be particularly valuable to the Hawaiian sugarcane industry, as there is an increasing world market for renewable sources of pulp for the paper industry. New products include nonnutritive food bulking agents, water soluble polymers, and water absorbent polymers. Nonnutritive food bulking agents should retain the sweetness and palatability of sucrose, but should not be metabolized by the body and should be heat stable. The development of a truly water soluble biodegradable polymer would be a significant step in reducing the problem of solid waste disposal. The aim of the water absorbent polymer research is to develop a modified nylon which is water absorbent and which can be made into a high comfort fabric.

NATIONAL CLONAL GERMPLASM REPOSITORY HILO, HI

Mr. **Akaka**. Dr. Plowman, identify the tropical varieties that the Hilo Germplasm Repository is responsible for maintaining.

Dr. **Plowman**. At the present time, we maintain 14 tropical fruit and nut crop varieties in the National Clonal Germplasm Repository at Hilo. These crops are pineapple, macadamia nut, papaya, guava, passion-fruit, breadfruit, acerola cherry, lychee nut, rambutan, pulasan, peach palm, carambola, atemoya, and pili nut.

Mr. **Akaka**. Dr. Plowman, estimate the average cost—both direct and indirect costs—of maintaining a single variety in a USDA repository. Identify whether this average cost would apply to Hawaii or whether the average cost would be higher in Hawaii due to nonforeign COLA or other cost considerations.

Dr. **Plowman**. It is difficult to estimate the average maintenance cost of a single crop variety in the USDA National Clonal Germplasm Repository System. Many of the crops are maintained as trees in field plantings while others are maintained as potted plants in a greenhouse. Except for pineapple, all of the crops maintained in the Hilo repository are tree crops which have to be maintained in field plantings. This makes the Hilo respository expensive to maintain. Because of special cost-of-living allowances for Hawaii and the higher cost of conducting research in that State, the average maintenance cost per variety in Hawaii is about twice the average cost of maintenance for comparable plant material on the mainland.

Mr. **Akaka**. Dr. Plowman, using a unified table, identify the budget allocated to the Hilo germplasm respository for fiscal years 1988, 1989, 1990, and 1991, together with the number of tropical varieties which the repository was authorized to maintain and the average budget per variety.

Dr. **Plowman**. The total funds allocated for the Hilo respository by fiscal year, the number of crop varieties, and the average cost of maintenance per crop variety will be provided for the record.

[The information follows:]

	Total funds allocated	Total crop varieties	Average maintenance cost/crop variety
Fiscal year:			
1988	$150,600	7	$21,514
1989	149,300	14	10,664
1990	166,900	14	11,921
1991	166,900	14	11,921

As the need for preservation of additional tropical fruit and nut crop varieties increases and resources remain constant, there will be less funds available for preservation of each variety.

Mr. **Akaka**. Dr. Plowman, did ARS request additional amount to fully fund the cost of maintaining all varieties at the Hilo repository? If not, why not?

Dr. **Plowman**. We did not request additional funds specifically for the Hilo repository. There are many other locations and program areas of the National Plant Germplasm System that need additional resources, and we were unable to assign proposed increases to individual locations such as Hilo.

PLANT GERMPLASM ACQUISITION, MAINTENANCE, AND ENHANCEMENT

Mr. **Akaka**. The FY 1991 request by ARS contains an increase of $2,200,000 for plant germplasm acquisition, maintenance, and enhancement. Identify any amount that will be used to support the maintenance of germplasm at existing locations. Break down these amounts by location and activity.

Dr. PLOWMAN. We propose to allocate $350,000 to Beltsville, Maryland, for plant introduction and quarantine activities; $350,000 to Mayaguez, Puerto Rico, for winter nursery and quarantine activities to facilitate flow of germplasm to private and public breeders; and $1,500,000 to ARS headquarters. The funds held at headquarters will be used primarily to support genetic stock collections essential to research on fundamental genetics, breeding, and genome mapping.

OCEANIC INSTITUTE

Mr. AKAKA. In fiscal year 1990 and in past fiscal years, funds have been provided to ARS for a grant to the Oceanic Institute to carry out research on aquaculture feeds. What is the status of this project and what research has been accomplished to date?

Dr. PLOWMAN. The project entitled "Development of Feeds for Tropical Species of Finfish and Shrimp", a new 3-year Grant Agreement became effective April 1, 1989. Previous research demonstrated soybean meal could be used in shrimp diets. Research on the use of soybean meal products to optimize growth of shrimp is continuing. Research is also being conducted on feeds for mahimahi from fingerling to market size.

Mr. AKAKA. Of the funds provided in past fiscal years for feeds research, identify the amounts, if an~~y, used~~ to support the salaries of ARS staff located at the Oceanic Institute.

Dr. PLOWMAN. Funds from the ARS Grant Agreement were not used to support the salaries of ARS staff located at the Oceanic Institute.

Mr. AKAKA. In each of the previous three fiscal years, indicate the number of ARS staff that have performed research at the Oceanic Institute. Further indicate the extent to which funds received by the Oceanic Institute have been used to support the salaries of these personnel.

Dr. PLOWMAN. In the previous three fiscal years, two ARS staff performed research at the Oceanic Institute. Funds received by the Oceanic Institute in the ARS Grant have not been used to support the salaries of these personnel.

Mr. AKAKA. For FY 1990, an appropriation of $463,000 was provided to the Oceanic Institute. How will these funds be utilized.

Dr. PLOWMAN. These funds will be used by the Center for Applied Aquaculture Research and Training at the Oceanic Institute for acquisition of fixed and moveable equipment.

Mr. AKAKA. What amounts are contained in the FY 1991 budget to continue this activity?

Dr. PLOWMAN. For FY 1991 the estimated budget is $463,000.

FORMOSAN TERMITE

Mr. AKAKA. What is the status of research being carried out at the University of Hawaii on the Formosan termite, and what research is necessary in the future to address the pest?

[The information follows:]

The status of research at present is as follows:

1. Alternative to chemical control: the University of Hawaii has evaluated microbial pathogens as an alternative to chemicals; a fungal pathogen has been found that has control potential.

2. Wood treatment: the University of Hawaii is investigating alternative to arsenates. They are studying use of a sodium octaborate, a promising replacement.

3. Physical barriers: the University of Hawaii is developing use of basaltic barriers. These barriers will keep termites out. Therefore, the University of Hawaii is investigating the most efficient and effective means of installing basaltic barriers.

Future research should include:

1. Continuation of alternative to chemical control.
2. Continuation of the use of sodium octaborate.
3. Continuation of the use of basaltic barriers.
4. Initiation of predictive population models that will show how populations survive under various environmental conditions.
5. Development of control technologies for infestations in existing homes in contrast to new homes.

Mr. **Akaka**. What funds are provided in the FY 1991 budget for this activity in Hawaii?

Dr. **Plowman**. A total of $140,400 is provided in the FY 1991 budget, of which $122,500 will be for a cooperative agreement with the University of Hawaii.

RESEARCH ON SUGAR

Mr. **Akaka**. Identify the total ARS budget for research on sugar in FY 1990 and FY 1991. What is the justification for any increase or decrease in those amounts? If any increase or decrease is proposed, provide a justification of this change.

Dr. **Plowman**. The total estimated ARS budget for sugar crops research is $8,875,700 for both FY 1990 and FY 1991.

Mr. **Akaka**. Identify the total ARS budget for research on sugar at the Beltsville station in FY 1990 and FY 1991. What is the justification for any increase or decrease in these amounts?

Dr. **Plowman**. The toal estimated ARS budget for sugar crops research at Beltsville is $851,000 for both FY 1990 and FY 1991.

Mr. **Akaka**. Thank you very much.

Thank you, Mr. Chairman.

Mr. **Whitten**. Mr. Myers.

Mr. **Myers**. Thank you, Mr. Chairman.

Dr. Hess, Dr. Plowman and Dr. Carter, we certainly are longstanding friends.

IMPORTANCE OF RESEARCH

First, if I only had "X" number of dollars, a very small amount of money, to invest in agriculture, research would be the one place where I would invest it. Where to invest it in research, whether it is in house or what we used to call out house, I don't know.

I think the important thing is that we do research in agriculture. I go back to my own experiences. As a teenager, my Dad was trying to teach me farming and encouraged me to be a farmer.

It didn't stick that well. In fact, I decided 25 years ago I was about to run for Congress, and my Dad was about to disown me. In any event, I can recall back 50 years ago my father's ambition was to raise 100 bushels of corn on an acre.

Once in awhile you get very close to that goal. In wheat and soybeans, the yield has not gone up per acreage as much as it has in corn. We have done a much better job in research and development to the point where we are getting greater yields.

You spoke, Mr. Chairman, of the soybean people. I spoke to the soybean people several years ago. I suggested we needed to get yields up to 60 bushels an acre so we could be competitive with the world.

"We have got too much production now. We need to cut production down they'd say."

I think there is a world market there for our product if we can be competitive with the rest of the world. The Chairman often speaks about that with some of the things we have done both in the Department of Agriculture and in Congress. Productivity must go up per unit of labor and per unit of cost.

I know, Dr. Hess, you were with Purdue for a while in your career. I visit Purdue two or three times a year and see some of the work they are doing in plant genetics.

Are we spending enough in plant genetics? Is that the place to put it? To get productivity up, where is the best place to spend the dollar?

Dr. HESS. I think genetics and germplasm is a key area of investment for a number of reasons. One is to increase protein content to increase their international competitiveness. Another area is looking at disease resistance or insect resistance of crops. Genetics is a very important way to do it, particularly as we have so much concern from the public in terms of use of chemicals, as far as the food safety issue or ground water contamination and genetic resistance provides a good way of achieving, a way of dealing with insects and disease.

It also will help return greater profits because if you don't have to apply materials, you save the application expenses as well as the cost of materials. I don't mean to imply that we will have a chemical free agriculture.

I think we need to judiciously use chemicals as part of our arsenal as a highly efficient food and fiber system, but we can make improvements.

The other thing that makes it so attractive is we do have new ways of genetically improving crops through genetic engineering. We have proposed in our budget $15 million for the plant genome research, part of the national initiative. We do not propose to try to identify or map all the genes in the soybean or the corn plant because we have so many commodities that it would be hard to know where to start.

We are going to target our efforts in identifying the genes that are regulating agriculturally important characteristics like drought tolerance, for example, or insect resistance.

Mr. MYERS. Now I need water tolerance rather than drought tolerance. We have about 21 feet of water out there.

Dr. HESS. We will trade with you.

If you look at the distribution of our crops over the years, you see that they have been spread out as to where you can grow them. That is an example of how through improved genetics we have increased the tolerance to either too much water, too much drought or lower temperatures.

There are some citrus now that have greater hardiness. That is a generic approach.

I think certainly this is a key area of research investment.

Dr. PLOWMAN. Mr. Myers, since you mentioned corn, for example, I will tell you one of the reasons why Indiana produces more corn than 100 bushels per acre. We have had a very productive corn breeding program there in conjunction with the university. However, the real problems out there on corn have to do with stock and not blight.

The ARS University corn breeding program has developed resistance to all of those things and that germplasm is used not only there and throughout the Midwest.

Mr. MYERS. The record title of yields per acre has gone to Indiana in the last few times in a number of years.

Dr. PLOWMAN. We are also involved in the soybean program. In fact, we are doing work now on some characteristics that will maybe help develop a new industry, the tofu industry in this country. So, it is a very, very active and important program.

Mr. MYERS. Well, thank you.

Again, I am never quite sure where the best research is done, whether it is done in competitive bidding competition or whether it is done in-house. I think the important thing is that it is done.

Maybe competition within is also healthy. Through the years it has always been an argument in Congress where is the best place to spend our dollar will be. I don't think we have ever come to a conclusion.

Because of Gramm-Rudman and other constraints, we will only have a limited number of dollars this year to invest. For one, I would like to know where that can be best spent, where we can get the most bang for the buck.

The farmer sure needs the help. It is not going to help if every year we are going to have to give a subsidy to a farmer for raising or not raising the crops. Ultimately we are going to have to teach him and provide the tools, germplasm or whatever it may be, that is one of the tools a successful farmer learns to use.

I think that is really what the department ought to be doing. For one, I will continue to support all the research we can possibly afford.

Keep up the good work.

PLANT GENETICS RESEARCH

The ARS has had a long-term effort in plant genetics and breeding in cooperation with Purdue University in West Lafayette. Purdue has been discussing with Dr. Plowman the capability of expanding the current personnel conducting plant genetics research at the university.

What are the possibilities of expanding research in plant genetics at Purdue University for fiscal year 1991 in order to complement the current program?

Dr. PLOWMAN. We hope to expand our research in four areas; genetics of small grains, soybean diseases, and identification of genes for resistance against insects, and plant nematodes.

Mr. **Myers**. What resources are necessary to achieve the goals of the ARS with regard to Purdue University for the coming years?

Dr. **Plowman**. We hope that eventually each of these areas could be funded in the range of $400,000 to $500,000 annually.

Mr. **Whitten**. Mr. Durbin?

AFLATOXIN

Mr. **Durbin**. Thank you, Mr. Chairman.

I have been listening in the last two weeks of testimony to my colleague from Indiana describe life on the farm in Indiana.

Last week he told us the mosquitoes were as big as hummingbirds. This week you have a foot of water all over everything.

It sounds like the Myers farm is a good candidate for disaster relief, from everything I hear.

I wish you the best of luck on your spread. I can understand why you are still in Congress.

Aflatoxin is a major concern to corn growers. They have asked me to give a helping hand. Last year we included $750,000 in the budget for research.

Do you feel this increase was adequate to meet the goal of eliminating aflatoxin as soon as technologically feasible?

Dr. **Plowman**. You are talking about a huge piece when you talk about eliminating aflatoxin. I don't know if we will ever do that. I am not sure that will ever be possible. There are a lot of things we can do.

The increase is certainly helpful. We are spending now about $4.2 million on aflatoxins. Aflatoxin develops because of stress.

The year we had a lot of drought problems is when we had the most. We will continue to have it.

All these techniques we talked about, the plant resistance to that as well as other management, things we might do to evaluate the problem because it certainly is a big impediment to our crops.

Mr. **Durbin**. The budget request for the next fiscal year will allow you how much more to address this problem?

Dr. **Plowman**. We are going to include another $1.6 million.

Mr. **Durbin**. Over and above the $4.2 that you mentioned? That will be good news across the Midwest. It is a serious concern.

BIODEGRADABLE PRODUCTS

Can I ask you on a related corn issue about degradable plastics? It seems to be an issue of great controversy. Many of us are hopeful we can develop a corn starch based degradable plastic that will help us deal with the problem of solid waste.

Have you found anything in your work so far to indicate that this effort should be pursued and is promising?

Dr. **Plowman**. Yes, we are optimistic. I hope perhaps in your travels you might visit Peoria, Illinois. A few months ago I was shown materials that have 70 percent corn starch. That is a whole lot bigger than the 30 percent you find in some of these plastic bags.

Also, with a variety of other kinds of things besides bags that might be used in biodegradables. We are making a big investment in that area.

We think it is important and we think it has a lot of possibilities.

Mr. **Durbin**. Have you done research on the impact of acid rain on agricultural production? Have you looked into that issue?

Dr. **Plowman**. That is a controversial issue, certainly. We have done some short-term experiments that show that on cultivated crops it is not a big problem. But, they have not been long term in nature. I would say at this point I wouldn't want to say there is no impact on that.

Where we have artificially exposed some crops to the acid rain conditions, we found that those effects aren't very big, but it still deserves further study. We plan to pursue that.

Mr. **Durbin**. That has to do with the duration of exposure?

Dr. **Plowman**. What we have been doing now has been short duration stuff. It needs to be extended to longer periods of time.

GROUNDWATER QUALITY

Mr. **Durbin**. My last question relates to survey conducted in the State of Iowa. Their state water survey disclosed that half of the wells in the State of Iowa had unacceptable agricultural chemicals or bacterial contamination.

Now, I don't want to pick on Iowa because we have not done a similar survey in Illinois, but I am sure we might find similar conclusions.

Can you tell me what is being done from your perspective to address those water quality concerns we have been hearing about across the United States?

Dr. **Plowman**. Yes. That is true, that is what the survey said.

But, there is a lot of other information that needs to be collected. For example, no one knows at this point whether the contamination in those wells was because the farmer, mixed his chemicals at his well.

No one knows whether it is contamination of the well site or whether that is contamination of the ground water. That is not a clearcut situation.

What we are doing in our total water quality is looking at a broad number of things. For example, some of the pesticides and nitrates leach down through the soil, which means that we have to develop tillage and cropping methods so that those things don't get down below the root zone.

We are trying to characterize where the problems are, what is causing the problems and then develop some production practices so that they can be mitigated.

Mr. **Durbin**. There was $500,000, I may be wrong on this figure, that we appropriated in this subcommittee last year to a joint effort by several universities in Illinois to look into ground water contamination.

I hope we can continue that effort. It sounds as if it is consistent with the goals that you have just stated.

Dr. **Plowman**. That is very true. The department has a very ambitious water quality program that involves not only the research agencies in the department, but also Extension and the Soil Conservation Service, the Forest Service and others that are concerned with the problem.

We do have a balanced program that will be moving in a very aggressive manner this year to get on with those problems.

Mr. DURBIN. Would you provide a summary of the specific activities ARS has undertaken to address water quality problems in Illinois?

Dr. PLOWMAN. ARS is promoting a strong integrated research program on water quality at Urbana, Illinois. A water quality research team has been formed by refocusing the work of four scientists at Urbana, and by providing the additional resources needed to hire a soil microbiologist to support the objectives of the planned research. The primary objective of this team's research will be the development and evaluation of weed control technologies that minimize herbicide movement to ground water. Emphasis will be placed on quantifying the impacts of current tillage practices and controlled release herbicide formulations on ground water quality. Total funding for water quality research for the current fiscal year is about $550,000.

Mr. DURBIN. Thank you for your responses and the priorities that you have outlined. We want to add the John Myers farm to this list of priorities. I think we can show some real success if we stick to it, John.

Thank you, Mr. Chairman.

Mr. WHITTEN. We will recess.

[Brief recess.]

Mr. WHITTEN. Let's take a minute, if I may.

I have been rather skeptical here. May I say that when I first got on this subcommittee, a gentleman contacted me trying to get extra money for research and experimentation. I said what do you want it for? He said if we have to tell you what we want it for, we don't want it.

The next thing, the first committee hearing I went to, someone went before the Foreign Affairs Committee and said let us sell American products overseas. At that time the agriculture attache had to report to the Secretary of State.

I appreciate the fine job all of you do and the sincerity you have in your work.

Mr. Skeen?

SCREW WORM RADIATION

Mr. SKEEN. Thank you, Mr. Chairman.

We have had certainly an exhilarating discussion going on here. I am sorry it was interrupted by the necessity to go vote. I want to say before we get started that the flack with the radiation program on flies, I can attest to the efficacy of that program.

If it is anything like the screw worm program in the Southwest, I want to tell you that has been the most outstanding piece of research that was done and the most effective program I have ever seen.

Those of us who lived in that part of the country and went through a summer doctoring screw worms can attest to the fact that it was a good approach.

You folks are to be commended for continuing on with that kind of research

I also agree with the statement that has been made before that if we don't have research, we aren't going to have agriculture.

The agriculture today is so different than it was 10, 15, 20 years ago. I know because I have spent my entire life in agriculture. It hasn't always been easy because the agricultural community doesn't really adapt to change rapidly.

It is a slow moving kind of industry. You folks, I think, have led the way. We appreciate the intelligence and hard work you put in on it.

FOOD QUALITY AND SAFETY

One of the things I am concerned about is food quality and safety and what it has done to agriculture. It is probably the most important perception problem that we are dealing with in agriculture today.

I think that we take quality for granted in agriculture, but the risks and the dangers inherent have come to the front. I am concerned, because at times I think that we are over stressing the risk.

What I want to know is what is ARS doing to highlight the kind of risk assessment that we need to counter the scare tactics that are going on in agriculture today?

I say as a side line to that, I appreciate the fact that somewhere along the line, the USDA came out, and highlighted the fact that we need to understand the relative risks involved in the food chain as it is today, particularly the understanding that there are enough carcinogens occurring naturally in food to cause some real concern.

If you want to be concerned about every little bit of risk associated with the food supply, you ought to take a look at what occurs naturally.

I would like to hear an assessment of how quickly we can turn this around and educate the public not to be alarmed.

FOOD ASSESSMENT

Dr. **Plowman**. I might make a couple of comments. Dr. Hess, I am sure, will have some more to say. We are not, ARS is not deeply involved in risk assessment type things.

That has not been part of our mission, our goals or responsibility in the department, although we share the exact same kind of concerns that you do. I can tell you there has been a lot of discussion in the department the last few months on how we can get together with some of the other agencies of the departments of government that do work on those things to lend our expertise to bring some sanity into this program.

Dr. **Hess**. The department is planning to launch a program with the Economic Research Service and the Agricultural Marketing Service doing sampling to find out what the actual levels are.

One of the problems we had when alar broke is there were all kinds of estimates of what the level of contamination was. People lost credibility because no one could agree.

Mr. **Skeen**. That is the thrust of the question, the reason.

Dr. **Hess**. Based on the experience in California, where they have quite a very, thorough sampling process, we know that the residues are very, very low and almost always, if there is a residue, it is below the levels which are considered dangerous.

We feel that we need that information on a national basis. The plan is to work with State departments of agriculture to get solid information so we are not dealing with emotion, but we are dealing with fact.

Mr. **Skeen**. You are not doing extensive research on the hazardous side of this equation. You are more prospective as far as progress and technology rather than economic risk assessment, things of that kind?

Dr. **Hess**. We have been talking about a joint effort between EPA, FDA and Agriculture in the area of risk assessment. There are some very serious questions in terms of what is risk.

It depends upon what tests you are using and how the test organisms are handled. For example, in talking with Frank Young, formerly Director of FDA, recently, he pointed out that if you use the term toxicity and they are fed a maximum caloric diet, then the number of tumors is 80 percent greater than if they were fed, say, an average caloric diet. There is, I think, a lot of work that needs to be done to determine what truly is the risk level.

Then, of course, we have the problem that we are using data which extrapolates from rat studies into humans, and how accurate those are is something that there is not full agreement on.

We have a lot of work to do in this risk assessment area.

Mr. **Skeen**. Be careful about the kind of animals you use. I would encourage at least somewhere in this great bureaucratic response to research, there are so many different facets to be investigated, that somewhere along the line you do exactly that.

Some kind of coordination is needed in the research effort to identify and quantify risk in such a manner that the American people or people throughout the world, as far as that goes, are educated on current risks. In response to some of those alarming situations or issues that arise, no one can quantify it because no one has an accurate description of what we are talking about.

Somewhere we need this kind of coordination.

I just hope in your budget, or in your analysis and in your research effort, that you can find some room for doing that.

RESEARCH PRIORITIES

Dr. Plowman, you mentioned prioritization. How much additional funding would be needed if you adequately funded the priority efforts that you are dealing with now?

Is your budget adequate to handle it?

Dr. **Plowman**. Our budget isn't adequate to handle it, which means we go through a lot of motions all the time to see where we can shift resources to things of higher priority.

The problem is the things that we say we need to do, or that we should shift out of are still things that are necessary to do. Let me just give you an example of—well, in your area we have a ginning laboratory.

It is the only one in the country that works on long staple fiber for cotton. It is very difficult to keep that program going.

Mr. **Skeen**. We go through this agony every year. I know you agonize over it as well.

Dr. **Plowman**. Another area that is very underfunded we think is the whole range-livestock interface that is so important to the West. We have not had any program increase in that area for years and years.

So what we do all the time, we just keep downsizing without really solving the problems. To give you a dollar figure at this time, I would not be prepared to do that.

Mr. **Skeen**. I am more interested in your statement that it is not adequate. You are having to do the kind of prioritizing or the priority assessment you do constantly to come up with your programs and make your programs work.

That gets to be a hard call to go through this budgeting process each time. We think we know what our priorities are and you have got your priorities, and we are having a difficult time sometimes meeting in the middle here.

ORLANDO LABORATORY

Dr. Plowman, I have a colleague in Florida, who informed me you have a potential problem regarding the ARS facility in Orlando, Florida.

The City of Orlando, as I understand it, wants it back. What is the situation there?

Dr. **Plowman**. The situation is that many years ago we constructed a citrus research laboratory in Orlando. For some reason or other, the city has grown up around it.

It is a very desirable spot for the city, but it is not a desirable place for us to do the kind of work we need to do in citrus research, in growing orchards and putting pesticides and other kinds of things on them. It is becoming a very difficult thing for us to stay there.

The city would like it back for what they would consider higher priority areas. We have had some dialogue with them about the need to find a new location.

Right now we are in the process of identifying the criteria that we would set forth in determining what kind of a laboratory and what kind of facilities we would need to impact these citrus problems.

Mr. **Skeen**. Have you considered the cost for the planning and relocation?

Dr. **Plowman**. We have very rough figures.

Mr. **Skeen**. Just preliminarily?

Dr. **Plowman**. Yes.

Mr. **Skeen**. You have not gotten that far.

ANIMAL RIGHTS

This is for Mr. Weber who may not be able to get back here. His question has to do with the animal rights versus the animal welfare debate. We all understand the need to promote, in a responsible way, the welfare of animals.

However, he and I are concerned about the directions the debate is taking. Certain animal rights groups are trying to get us to question whether or not we as a society should be able to use animals for any purpose.

I am wondering what your views are on this matter, and if the department is currently engaged in any research projects which utilize animals?

If so, have any of the researchers, to your knowledge, been threatened?

Dr. **Plowman**. Some of our researchers have been threatened. We are also aware of others in the animal research arena that have, including some that have died. We have had some breakins at our Beltsville Center and release of some of the animals that we were working with. That is of concern to us.

We feel there is a lot of work that is impossible to do without animals. It would be our position that we need to use them where it is appropriate, recognizing that we are as interested as anyone else in the proper care and treatment of livestock.

We think that we can't have an animal production system in this U.S. that does not take good care of animals because it impacts their productivity if you don't.

In our research, we are always looking for new techniques to measure the same kind of response that you would get with live animals. But, I don't foresee the time when we can eliminate animals from doing certain kinds of work.

Mr. **Skeen**. I appreciate that response. As one who has been in animal husbandry practically all my life, I have a very curious approach. One of the first things you learn to do is you take care of your livestock. That is a human responsibility.

They talk about animals' rights and that human beings are just another form of animal.

We are one of the few kinds of animals that also has a responsibility. That is a little bit different. I have listened to the debate and read about the debate, and I am absolutely amazed at some of the conclusions that the rationalizations take.

COTTON GINNING LABORATORIES

Mr. **Skeen**. Please provide for the record the funding levels in FY 89 and FY 90 for each of the three ARS cotton ginning laboratories, and the level of funding that would be needed in FY 91 to continue, at current levels, the work that is being carried out at these laboratories. Please provide the proposed funding levels that are included in the FY 91 budget for each of the three ARS cotton ginning laboratories.

Dr. **Plowman**. Should additional pay cost be appropriated by the Congress, the funds will be adjusted accordingly.

[The information follows:]

Location	Fiscal year 1989 available	Fiscal year 1990 available	Fiscal year 1991 estimated
Stoneville, MS	$878,200	$1,043,600	$1,043,600
Las Cruces, NM	499,600	670,300	670,300
Lubbock, TX	493,500	664,200	664,200
Total	1,871,300	2,378,100	2,378,100

ARID LANDS

Mr. **Skeen**. Please provide for the record the type of range research, if any, ARS is conducting on desert or arid lands Please include where this research is being conducted and the level of funding for this research in FY 90 and what is proposed in the FY 91 budget.

Dr. **Plowman**. The ARS range research program is funded at $11,600,800 for FY 90 and FY 91. The goal of this research is to improve rangeland productivity and increase profit from multiple-use management while protecting the basic resource. The range research program spans many different ecosystems and is conducted at 25 locations.

We will provide a list for the record.

[The information follows:]

Boise, ID; Bozeman, MT; Burns, OR; Cheyenne, WY; College Station, TX; Dubois, ID; Durant, OK; El Reno, OK; Fargo, ND; Ft. Collins, CO; Frederick, MD; Ithaca, NY; Las Cruces, NM; Lincoln, NE; Logan, UT; Mandan, ND; Miles City, MT; Beltsville, MD; Reno, NV; Sidney, MT; Temple, TX; Tucson, AZ; Weslaco, TX; Albany, CA (WRRC); Woodward, OK; Buenos Aries, Argentina and Rome, Italy.

Dr. **Plowman**. Research directly related to the more arid and desert range ecosystems represents about 46 percent of the total range research budget and is primarily conducted at the following eight locations: Las Cruces, NM; Tucson, AZ; Reno, NV; Logan, UT; Boise, ID; Dubois, ID; Temple, TX; and Burns, OR. Selected research themes from these locations are as follows: Improving forage productivity, management, conservation, and utilization on arid rangelands; Rangeland ecology; Range ecosystems management; Plant/animal interfaces; Biological control of rangeland weeds; Genetics and breeding of improved rangeland plants; and Rangeland hydrology and erosion research.

The FY 90 and FY 91 funding levels for the eight ARS locations conducting range research in the more arid and desert rangelands will be provided for the record.

[The information follows:]

Location	Fiscal year—	
	1990 Available	1991 Estimated
Las Cruces, NM	$554,500	$554,500
Tucson, AZ	1,028,600	1,028,600
Reno, NV	673,100	673,100
Logan, UT	1,255,800	1,255,800
Boise, ID	324,300	324,300
Dubois, ID	186,300	186,300
Temple, TX	756,700	756,700
Burns, OR	238,000	238,000
Total	5,017,300	5,017,300

U.S.D.A. RESEARCH

Mr. **Skeen**. Please provide the total research budget within USDA for FY 1990.

Dr. **Plowman**. The total USDA research budget for FY 1990, excluding construction, is $1,145.0 million.

Mr. **Skeen**. Please provide the level of funding that would be needed in FY 1991 to continue all ongoing research programs.

Dr. **Plowman**. Based on projected inflation of roughly 4.2 percent for these programs, $1,193.1 million would be required to maintain current program levels. In contrast, the USDA budget proposes a total of $1,196.7 million.

Mr. **Skeen**. Please provide the level of funding within the proposed FY 1991 budget for all USDA research, excluding the $100 million for the National Initiative for Research on Agriculture, Food and Environment.

Dr. **Plowman**. The proposed FY 1991 budget includes $1,096.7 million for all USDA research programs excluding the $100 million for the National Initiative.

BARLEY YELLOW DWARF VIRUS [BYDV]

Mr. **Skeen**. I understand that Barley Yellow Dwarf Virus is the number one virus disease problem in barley, oats, and wheat in the world. As part of an organized research effort to combat BYDV, the ARS in the past allocated $490,500 to the Plant Gene Expression Center in Albany, California, to develop technology to move specific plant genes into small grains that will result in immunity to BYDV. I also understand that to date these funds have been used to refine genetic transfer techniques on crops other than barley, oats, and wheat for which they were originally allocated. When does the ARS plan to fulfill its commitment to study gene transfer in small grains at the Plant Gene Expression Center?

Dr. **Plowman**. A method for transferring individual genes into monocotyledenous plants including barley and other grain crops has not existed. Therefore, the Plant Gene Expression Center developed such a method. This was accomplished by December, 1989. The Center utilized corn as the model plant for developing this method, because it is considerably easier to do such research on corn than on barley. ARS is now ready to conduct follow-up research on barley and other small grains. The objective will be to transfer genes into barley and other small grains that provides a high level of protection against the virus and its insect vectors. The scientist who conducted this research is leaving for a post in the private sector. He will be replaced with a new hire who will continue the research directly on barley.

NOXIOUS WEEDS

Mr. **Skeen**. I understand the State of Florida has experienced severe problems in the area of noxious weeds. Exotic plants such as hydrilla, waterhyacinth, Eurasian watermilfoil, and the melaleuca tree are causing substantial problems to the lakes and wetlands of Florida. Would you provide for the record the amount of money that was appropriated for FY'90 for aquatic research. It would also be helpful if you could break this amount down and explain how much of these research dollars went to Florida and for which specific projects.

Dr. **Plowman**. The ARS appropriation for aquatic weed research in FY 90 was $1,196,800. Of this amount, $706,300 will be expended in Florida.

[The information follows:]

Research area	*Fiscal year 1990*
Biocontrol of aquatic weeds	$367,300
Basic aquatic weeds biology and herbicide research	339,000

Mr. **Skeen**. What initiatives has ARS taken to incorporate biological control against the aquatic weeds and what problems has ARS experienced in attempting to incorporate biological controls into their aquatic weed management programs?

Dr. **Plowman**. The majority of our aquatic weed control research is focused on the development of biological controls. Some of our major successes in weed biological control are alligatorweed and hydrilla, both of which are aquatic weeds. Two new insects for control of hydrilla are in development and are in the early stages of a release program. We have not experienced any unusual problems in applying biological controls to aquatic weed problems. However, development of biological control agents is a lengthy process due to the extensive research needed to ensure that these agents will not damage endangered species or other desirable plant species.

Mr. **Skeen**. Could you bring us up to date on the two on-going aquatic weed research programs in Florida, the research programs at the IFAS center in Ft. Lauderdale and the Aquatic Weed Center at the University of Florida?

Dr. **Plowman**. ARS and University of Florida's Institute of Food and Agricultural Sciences have a long history of cooperative aquatic weed research dating back to 1955. ARS aquatic weed scientists in Florida are currently located at IFAS Fort Lauderdale Research and Education Center, and they work cooperatively with IFAS aquatic weed scientists at that location. In recognition of the severe water resource management problems created by hydrilla, waterhyacinth, and other aquatic weeds, the Florida legislature established the IFAS Center for Aquatic Weeds at Gainesville. The overall mission of this Center is to enhance and coordinate aquatic weed research and extension activities in Florida. The research thrusts of the IFAS aquatic weed research programs at both Fort Lauderdale and Gainesville are to develop a basic understanding of the biology and ecology of nuisance aquatic vegetation; develop chemical, biological, cultural, mechanical, and integrated aquatic plant management techniques; and determine the ecological effects of both the control technologies and the nuisance vegetation on water quality and aquatic organisms. In FY 80, Congress added $450,000 to the ARS budget in order to enhance the cooperative research between ARS and IFAS. As specified in the add-on language, ARS and IFAS entered into a cooperative agreement to fund high priority research programs. The original agreement provided $191,600 annually to the IFAS Center for Aquatic Weeds. Over the years this amount has steadily decreased to the current level of $160,522 due to Federal budget reductions and increased costs within ARS.

MELALEUCA

Mr. **Skeen**. What are ARS's plans to address the biological control of the exotic wetland tree Melaleuca that from my understanding is virtually taking over the wetlands of South Florida.

Dr. **Plowman**. ARS scientists are working with several Federal, State, and local South Florida agencies and organizations to develop technology to control melaleuca. An ARS scientist is currently evaluating potential biological control agents in Australia.

Mr. **Skeen**. I appreciate your response and I appreciate you all being here today and just enjoy working with you.

Thank you very much.

Thank you, Mr. Chairman.

PRIVATIZATION

Mr. **Whitten**. My experience leads me to have certain feelings, which happens to all of us, I guess. I notice the use of the word "privatization." Several years ago I tried to look up the definition, and there is none in the dictionary. There wasn't at that time.

It reminds me of when I first came to Congress. I had been a district attorney. The circuit judge and I were very close to the same people.

The judge wrote me about this fellow coming to see him who we both knew. He mentioned the name. I knew what to expect.

He said this fellow had been in to see him. He said Judge, I want you to write Jamie. He said every time the Farmers Home Administration buys anything, they give my brother a 20 percent cut. The Judge said, well, Jamie will put a stop to that. He said I don't want that. I want him to make them cut me in on it.

Privatization means everybody making a profit out of it, from my observation.

It may be fine, but that is what it is. If we get all this brains, intelligence and experience, and I agree with all of that, I think we should use it instead of letting somebody have some extra pay out of it.

One of the things that gets me is for 48 years, the farmer got his fair price from the buyer. Labor has laws that let them get a fair wage, industry has laws that let then pass it on to the buyer.

Nobody hollers at them. We had that for 48 years. Now we pay the processers about $3 to $4 billion to export.

We give to all our big companies money to promote their products. You know who they charge it to? The farmer. We had the Department's economic advisers in here. Unfortunately, he can't make a sound project because he doesn't know what policy the Federal Government is going to use in the future.

They would stop it just like that if the State Department says its in the national interest. Or they will just open our gates and let all the stuff come in here in competition with domestic producers.

We had an investigation three years ago. In one day over 600 trucks came across the border from Mexico with competitive agricultural products. That is just one border crossing. We have opened up our domestic markets.

We work within limitations, and I thank you for staying with agriculture.

I don't know of anybody who studies agriculture in college anymore except the sons of someone who already farms, unless they studied to get a job like we have.

I appreciate all of you, the job you do. I have felt it necessary to bring these points out, most of which are beyond your control and beyond mine.

Thank you a whole lot.

Mr. Watkins?

BRUCELLOSIS RESEARCH

Mr. **Watkins**. I was one of those agriculture majors that joined Chairman Whitten. He is a wealth of information when it comes to agriculture and is respected by his colleagues for his fine work.

I gain a lot from his wisdom.

Secretary Hess, Dr. Plowman and Ms. Carter, thank you for coming.

Dr. Plowman what is the status of brucellosis research? Can we expect any kind of a—breakthrough?

Dr. **Plowman**. Well, I wish I could predict the outcome of research. I really can't predict that. I am optimistic of the progress we are making.

For example, we have a cooperative project at Oklahoma. That is going along very well.

They are working on a substitute vaccine that looks now like it has got some real promise. The program down there really incorporates two things.

Along with working on the new vaccine there is some real hope for a new diagnostic tool that will differentiate between animals that have active infections and those that have been vaccinated. That is one of the real keys to getting this disease eradicated in the country.

I am optimistic. That has been a long, slow process. The new tools that we have to work with, I think, are leading us.

SOUTH CENTRAL AGRICULTURAL RESEARCH CENTER

Mr. **Watkins**. I understand you were on the campus of Oklahoma State University a couple of weeks ago. I always welcome the opportunity to have members of the ARS Administration team visit our good State.

I hope you left a little money down there. We need it. I have a series of questions on brucellosis because that is one of the things I have a great concern about, and also the South Central Agricultural Research Center. We put in $290,000 the last two years to do planning on Phase III.

Can you tell me where that stands, what you have planned, what the budget figures are and what you plan for the center as far as meeting the expansion needs?

Dr. **Plowman**. Well, I would be glad to do that. As you know, the $290,000 was planning money to design what we are calling Phase III of the research center.

Phase III really brings together all of the components that we need to commercialize things because it adds the post harvest and processing and packaging part. The planning is in process. It will be done during this fiscal year.

The plan also calls for the construction of the new facility at about $3.4 million.

Mr. WATKINS. Do you have that in the budget?

Dr. PLOWMAN. It is not in our present budget, no.

Mr. WATKINS. Do you think that could be done this year or the beginning of next year?

Dr. PLOWMAN. We would have the—the planning would be finished for 1991 fiscal year.

GROUNDWATER QUALITY

Mr. WATKINS. I want to turn to the subject of water quality. We have the ARS water quality laboratory in Oklahoma. Fortunately, we have a lot of expertise and talent in that facility.

With all the emphasis being placed on ground water or water quality, we also have started a consortium at Oklahoma State, OU, and Rice University dealing with this issue. In addition, our State has the Robert Kerr EPA Environmental Quality Laboratory located in Ada, Oklahoma.

I would like to encourage ARS to take the lead to get those entities in Oklahoma together to work on this issue. I think that we should dovetail our expertise, do some planning, save the taxpayers a lot of money, but also get a real jump on some of the additional water quality research that is needed

Someone is always waiting on someone else to start. I would like to encourage ARS to contact the other groups, and formulate a work task force.

There is no need for us to reinvent the wheel or go different directions. I am excited about what the combination of these three major groups can do on water quality if everyone will work together.

Dr. PLOWMAN. We will certainly do that. ARS can't do everything. We feel very strongly in this whole water quality business that we need to join hands with not only the other federal agencies, but also the State people involved, too. We will take your words and move forward with that.

Mr. WATKINS. I appreciate it. You are welcome always in Oklahoma.

BRUCELLOSIS RESEARCH

Let me return to the subject of Brucellosis. What specific research is being conducted and at what locations?

Dr. PLOWMAN. The ARS National Animal Disease Center, Ames, Iowa, is working on a diagnostic test that will differentiate between vaccinated and infected animals and on a genetically deleted live vaccine that lacks a major protein antigen. This product would allow diagnosticians to differentiate vaccinated from infected animals.

ARS also supports extramural research on Brucellosis at Oklahoma State University, Iowa State University and Texas A&M University.

Oklahoma State University is developing a subunit vaccine, using *Escherichia coli* as an expression vector, and has developed a very sensitive DNA diagnostic probe.

Iowa State University is also developing a subunit vaccine, using *Salmonella typhimurium* as an expression vector.

Texas A&M University is conducting basic research on mechanisms of resistance and characterizing surface components of Brucella which will be useful in the development of synthetic vaccines and diagnostic tests.

Mr. WATKINS. How close are we to seeing some positive results on the research being conducted? What specific research results will most likely contribute to the eradication of brucellosis?

Dr. PLOWMAN. The research on subunit vaccines has yielded some extremely important information on the antigentic components of Brucella organisms, but the subunit products that have been tested so far have shown only partial protection in mice. The genetically deleted live vaccines being developed at NADC may be ready for immunogenicity testing in cattle in 1992. The development of an effective vaccine which permits differentiation of vaccinated and infected cattle appears to offer the best approach to the eradication of brucellosis.

Mr. WATKINS. What part of the research is being done with Oklahoma State University? What are your plans for continuation of this research at this location?

Dr. PLOWMAN. Oklahoma State University is involved in the isolation, characterization, and expression of *B. abortus* genes in *E. coli* in order to create a subunit vaccine. We consider these collaborative studies very fruitful and expect them to continue.

Mr. WATKINS. How much is ARS spending on brucellosis research in FY 90 in Oklahoma?

Dr. PLOWMAN. ARS is spending $336,200 on brucellosis research in Oklahoma in FY 90.

Mr. WATKINS. How much do you expect to spend on brucellosis research in FY 91 in Oklahoma?

Dr. PLOWMAN. ARS expects to spend $336,200 on brucellosis research in Oklahoma in FY 91.

Mr. WATKINS. What specific field work is being done and planned for Oklahoma?

Dr. PLOWMAN. No field work is currently being conducted in Oklahoma. Discussions are being held between Oklahoma State University and NADC on mechanisms for future testing of subunit vaccines developed by Oklahoma State University.

Mr. WATKINS. How much is ARS spending on brucellosis research in FY 90?

Dr. PLOWMAN. ARS is spending a total of $3,110,000 on brucellosis research in FY 90.

Mr. WATKINS. How much do you expect ARS to spend on brucellosis research in FY 91 nationwide?

Dr. PLOWMAN. ARS expects to spend $3,110,000 on brucellosis research nationwide in FY 91.

SOUTH CENTRAL AGRICULTURAL RESEARCH CENTER

Mr. WATKINS. Could you provide an update for the Committee on the kind of activities being conducted either directly or indirectly at the South Central Research Center and the cooperative efforts of the scientists with industry to develop a commercial alternative crops industry to Southeastern Oklahoma.

Dr. PLOWMAN. We continue to expand research on potential alternative crops and farming opportunities that will benefit farmers in the entire South Central production region. These crops include peaches, blueberries, blackberries, raspberries, strawberries, grapes, sweet corn, carrots, asparagus, beans, tomatoes, Irish potatoes, sweet potatoes, onions, cucumbers, watermelon, cantaloupe, squash, broccoli, peppers, eggplant, okra, and turnip. We recently added kenaf as a possible economic crop, where yields of 6 to 9.5 tons of dry stalk per acre have been reported. Research on catfish production systems continues, and new research has been initiated on off-flavor and quality of catfish. We continue to expand contacts with the agricultural community which includes presentations of research at grower meetings and providing technical assistance to growers on production and marketing of individual crops. We are particularly pleased about the close working relationship that has developed between our scientists at Lane and the Three Rivers Produce Association at Atoka, a project of the RedArk Development Authority, McAlester, Oklahoma.

Mr. WATKINS. How many scientists are currently located on site? How many are OSU scientists and how many are ARS scientists?

Dr. PLOWMAN. We currently have 11 scientists located at Lane: 6 ARS scientists and 5 Oklahoma State University scientists. Four additional scientists are located off-site, one of whom is a State scientist.

Mr. WATKINS. It is my understanding that all the space in the existing facilities is now being utilized fully and without the final phase of the facility that further research work will be hampered. Is that the case and what additional dimension of research is needed?

Dr. PLOWMAN. All of the space in the existing facility is being utilized. Future research would focus on soil structure, preparation, erosion, and fertility; agricultural engineering as it relates to field irrigation, pesticide application, and seed and fertilizer placement; fruit and vegetable disease problems, particularly the preharvest diseases; and postharvest physiology of peaches, blueberries, strawberries, and other fruit crops.

SOUTH CENTRAL AGRICULTURAL RESEARCH CENTER

Mr. WATKINS. Specifically, what will be included in Phase III?

Dr. PLOWMAN. Phase III will consist of a 10,580 square foot office and laboratory addition, a 4,000 square foot addition to the headhouse/greenhouse, a 9,216 square foot pre-engineered metal building for post harvest research and storage, and chemical storage buildings.

Mr. WATKINS. This committee has provided $290,000 for planning Phase III. What is the planned cost?

Dr. PLOWMAN. The entire $290,000 will be used to design a $3,400,000 construction project.

Mr. WATKINS. What is the status of planning the facility and do you have the capability to utilize the construction funds in FY 1991?

Dr. PLOWMAN. A contract for pre-design and design phase services is scheduled for award during the second quarter of FY 1990.

We expect the design to be completed by the first quarter of FY 1991.

SOUTH CENTRAL AGRICULTURAL RESEARCH CENTER

Mr. WATKINS. What is the proportion of ARS/CSRS scientists needed in Phase III?

Dr. PLOWMAN. We anticipate that we would need 4 ARS scientists and 2 State Scientists for Phase III.

Mr. WATKINS. What is the FY 90 level of funding for the Lane location: What does the budget indicate for FY 91?

Dr. PLOWMAN. The level of funding for the Lane location is $1,651,300 for both FY 90 and 91.

Mr. WATKINS. Will this funding continue to fully staff the facility and allow for the purchase of corresponding equipment?

Dr. PLOWMAN. Yes, this will allow ARS to fully staff the existing facility.

Mr. WATKINS. Provided that the Congress is able to appropriate funds for Phase III, what level of program funds will be needed to fully staff Phase III?

Dr. PLOWMAN. We would need an additional $800,000 for 4 new scientists and $350,000 for specialized equipment including high-speed liquid chromatograph, an atomic absorption spectrophotometer, and an expansion of the field plot irrigation system.

Mr. WATKINS. If, for some reason, this Committee does not add funds this year or next year for program funds, can you redirect funds to Lane so we can keep this high priority program moving?

Dr. PLOWMAN. Many of our other research projects which are of high priority are fully stressed in terms of funding support. Funding continues to decrease each year because of unfunded pay raises, Gramm-Rudman reductions, and general reductions in purchasing power resulting from inflation. Under these circumstances, reprogramming of funds is difficult to achieve. However, the Agency will continue to assess the needs of its programs and direct available resources to the most critical problems and areas of significant benefit to producers and consumers.

SOUTH CENTRAL AGRICULTURE RESEARCH CENTER—KENAF

Mr. WATKINS. Specifically what work is being done at Lane or at other locations in conjunction with Lane in regard to kenaf?

Dr. PLOWMAN. Specific kenaf research being done at Lane or at other locations in conjunction with Lane is: Variety trials at Lane and Muskogee, OK; Fertility trial at Lane, OK; Experiments concerning the time of harvest at Haskell, OK, and Ladonia, TX; Rotation study at Haskell, OK; Weed control experiments at Lane and Norman, OK; Plant population and row spacing tests at Lane, Merritt, Keota, and Walters, OK, and at Ladonia and Lubbock, TX; Plant growth regulator experiments at Lane, OK; Nematode resistance tests at Lane, OK; and exploratory tests for using kenaf as a cellulose energy source to enhance bacterial action for sludge disposal at Moore and Norman, OK.

Mr. WATKINS. What have been the preliminary results of kenaf production in Oklahoma and how does this compare to other areas?

Dr. PLOWMAN. At this time, only very limited observations and research results are available on kenaf production in Oklahoma. While it appears that kenaf can be grown satisfactorily in Oklahoma, it is too early to make specific yield and quality comparisons with other areas.

Mr. WATKINS. What additional work is being planned in the kenaf area? What is being done in product development area?

Dr. PLOWMAN. We plan to continue the variety testing and agronomic production research that is currently being done at Lane and associated locations. In the product development area, ARS scientists at Lane will continue exploring the use of kenaf to enhance the bacterial degradation of sewage sludge.

Mr. WATKINS. Can ARS work with industry to do cooperative research agreements that will assist in product development?

Dr. PLOWMAN. ARS has a well established policy and an extensive program working with industry through Cooperative Research and Development Agreements. In the case of kenaf, cooperative agreements were used to do preliminary work on uses in pressed board and in carpet underlay for automotive applications.

SOUTH CENTRAL AGRICULTURE RESEARCH CENTER—AQUACULTURE

Mr. WATKINS. What work is currently being done in aquaculture either on site at Lane or other locations associated with the Research Center? Where are the locations?

Dr. PLOWMAN. Investigations are being made at Lane on the cause of off-flavor in farm-raised catfish with attempts on linking the association of blue-green algae, fish off-flavor, and the energy and protein content of diets fed the catfish. Trained taste panel tests were conducted in cooperation with the Southern Regional Research Center, New Orleans, LA.

Research was conducted to increase catfish production per unit area of pond by increasing stocking rate and improving techniques for maintaining water quality. The effectiveness of biological filters was demonstrated at the higher stocking rate. Recirculating water through biological filters maintained water quality in production ponds and allowed higher stocking rate and higher yield of fish per unit area of pond.

Cooperative research is being conducted on production systems and food quality of catfish fillets.

Lane scientists are cooperating with Langston University, Langston, OK; Southern Regional Research Center, New Orleans, LA; Eastern Oklahoma State College, Wilberton, OK; Murray State College, Tishomingo, OK; Red-Ark Development Authority, Aquafarms Catfish, Holdenville, OK; Lake Texoma Project—Water Quality and Watershed Laboratory, Durant, OK; Army Corps of Engineers Regional Office, Tulsa, OK; Department of the Interior, Fish and Wildlife Service, National Fish Hatchery, Tishomingo, OK.

Mr. WATKINS. How many scientists and support personnel are dedicated to aquaculture research at Lane?

Dr. PLOWMAN. There are 2.5 scientists and 3.0 support staff dedicated to aquaculture research at Lane.

Mr. **Watkins**. This committee provided additional funds for FY 1990 to do further aquaculture work. How will these funds be utilized? What additional scientists will be hired?

Dr. **Plowman**. These funds will be used to conduct research on flavor, quality, and processing problems in catfish. An ARS scientist trained in food technology (catfish specialty) was reassigned to Lane.

DURANT WATER QUALITY LABORATORY

Mr. **Watkins**. How many scientists and support personnel are located at the Durant Water Quality Laboratory?

Dr. **Plowman**. There are 12 scientists and 20 support personnel located at the Durant Water Quality Laboratory.

Mr. **Watkins**. What is the scope of the work for the laboratory?

Dr. **Plowman**. The scope of the work at the laboratory encompasses the use of tracers for determining rates of soil erosion and sediment transport, better understanding of the cycling of agricultural chemicals in croplands and grasslands, the development of environmental models for improved management of agricultural and aquatic ecosystems, and assessment of the water quality impacts of buffer strips, wetlands, and farm ponds.

Mr. **Watkins**. When was the last time that this laboratory received a significant increase in program funding?

Dr. **Plowman**. An increase of $130,000 was received in FY 1985.

Mr. **Watkins**. Are there plans for doing further work at the Durant location in terms of groundwater quality?

Dr. **Plowman**. The program will be reviewed in April 1990 at which time a substantial strengthening of the groundwater quality component of the laboratory's program is planned. Equipment purchased earlier this year has increased the capability of the laboratory to undertake a major program in groundwater research.

Mr. **Whitten**. Our friend Mr. Watkins is a wonderful Member of Congress. He believes, as I do and as you do, that we need to look after our own country. That is our real wealth.

Mr. Weber?

MORRIS, MN

Mr. **Weber**. Dr. Plowman, as you may remember we had the opportunity to tour the ARS research facility in Morris last summer. During the tour we had lunch with the Barnes-Austed group which actively supports and promotes the facility. I have always been impressed with the amount of support the research facility receives from this group and if I remember correctly, it made an impression on you. In fact during your remarks at the lunch you stated and I quote "that you like to put federal dollars into research facilities that received the type of local support that you see here today." I see this facility playing an expanded role in the department's efforts on ground water research. However, I am not sure that adequate resources are being given to the facility so that it may expand as its mission and responsibilities expand. Would you care to comment on this and tell me what the subcommittee can do to assist this facility.

Dr. **Plowman**. The ability of the ARS facility at Morris to contribute to the Department's groundwater research was recognized by an increase in FY 90 of $400,000 to support additional program management and research on water quality. These funds are recurring. The laboratory is now filled to capacity with active scientists and is renting additional office space. Prerequisites to further expansion of its mission will be identification of high priority problems which this facility is particularly capable of solving. The current staff is developing a model which estimates the sensitivities of subsoils to compaction. Compacted subsoils limit depth of rooting; since increased depth of rooting is a primary means of ameliorating drought, the development of management practices to avoid or alleviate subsoil compaction may be a good investment. Also, the staff is developing a decision aid for managing weeds under rainfed conditions. We appreciate inputs of the Barnes-Austed group and the subcommittee's continued interest as our facility staff, the Midwest area office, and our National Program staff identify and prioritize such potentials for improvement.

ANIMAL RIGHTS VS ANIMAL WELFARE

Mr. **Weber**. Dr. Plowman, as you know, I have taken a real interest in the animal rights vs animal welfare debate. We all understand the need to promote, in a responsible way, the welfare of animals. However, I am concerned about the direction that the debate is now taking. As I see it, certain animal rights groups are now trying to get us to question whether or not we, as a society, should be able to use animals for any purpose. I am wondering what your views are on this matter and if the Department is currently engaged in any research projects which utilize animals? If so, have any of the researchers, to your knowledge, been threatened?

Dr. **Plowman**. ARS shares your concerns about the direction of the National Animal Rights/Animal Welfare Debate. Of the current 1,564 ARS research projects, approximately one-third use animal subjects, either farm animals or laboratory animals. The new knowledge and technology derived from this research provides wide-spread benefits to the entire public, not only to enhance animal well being (e.g. disease and stress prevention), but also to improve human health and nutrition.

ARS takes a very conscientious approach to the responsible care of experimental animals. We comply with all applicable laws, regulations and professional guidelines, as well as, consider the use of alternative or surrogate systems such as tissue culture, microbial systems, computer models and the like, before proceeding with actual animal experimentations. In 1987, a group calling itself the "Band of Mercy" broke into our Beltsville Agricultural Research Center, stole 48 cats (including newborn kittens and 11 cats infected with toxoplasmosis) and 7 genetically distinct miniature swine, damaged property, and stole valuable research records. In conjunction with the break-in, two scientists received death-threatening letters.

BARD

Mr. **Weber**. I am sure that you are familiar with the BARD program, a joint agriculture research program between the United

States and Israel. I would be interested in knowing if you feel that this program is adequately funded?

Dr. **Plowman**. I am very familiar with the BARD program. Currently, I am Chairman of BARD's Board of Directors.

Over the years, inflation has reduced the real value of BARD funds. The Board of Directors has given a lot of attention to maintaining adequate funding for BARD. One obvious step was to assure a realistic earnings rate for the BARD endowment.

BARD's total endowment is $110 million. For several years the earnings rate on the original $80 million endowment was fixed at 7 per cent. In 1984 a second subscription was tied to the floating London Inter Bank Offer Rate (LIBOR). The LIBOR rate regularly has been higher than 7 percent.

We have been successful in this regard. Through the efforts of the Board of Directors, we are amending the BARD agreement to tie the entire endowment to LIBOR. At current LIBOR rates, this will increase BARD's income about $1 million per year. These additional funds will enable BARD to fund more projects or to raise the average funding level of approved projects.

VARIETY SURVEY

Mr. **Weber**. The ARS in conjunction with the National Agricultural Statistic Service used to conduct variety survey and compile information for all major crops; i.e., commercial acreage devoted to a particular variety. This service was discontinued in 1984. Has ARS considered providing this service again and would it not be helpful to potential foreign customers to have this type of information?

Dr. **Plowman**. A wheat variety survey was conducted every five years through 1984, after which it was discontinued. ARS is willing to provide technical assistance if such a publication is renewed but considers such a publication to be within the purview of National Agricultural Statistics Service. The wheat variety survey is a statistical inventory of past wheat acreages by State and variety grown; it is not a research project. Such a publication could have substantial benefits in the domestic and export marketing of wheat.

Mr. **Whitten**. Mr. Conte, the ranking Member of the Appropriations has some questions he would like answered for the record.

[The questions and responses follow:]

Narcotic Crops

Mr. **Conte**. Please provide an update of ARS research into the eradication or control of illicit narcotic crops.

Response. ARS is conducting research on all aspects of narcotic crops including basic plant physiology, biochemistry of drug production in the plants, and development of herbicide and biocontrol technology to control illicit drug crops. Current emphasis is on the development of control agents against *Erythroxylum coca* (the source of cocaine) with most of the effort focused on identification and development of a suitable herbicide.

Mr. **Conte**. What are your goals for this research?

Response. The main objective is development of a control agent against *Erythroxylum coca* (the source of cocaine) with most of the effort focused on identification and development of a suitable herbicide and biocontrol agents. The goal of the physiology and biochemistry research is to discover possible metabolic processes in the plants that would be vulnerable to alternative methods of controlling the crops or their production of drugs.

Mr. CONTE. How much have you expended on illicit narcotic crop research in the past ten years?

RESPONSE. Over the past 10 years, ARS has expended $15 million on research for control of illicit narcotic crops.

Mr. CONTE. What has this research accomplished?

RESPONSE. This research has resulted in the identification of several herbicides for control of narcotic crops. The herbicides 2,4-D, paraquat, and glyphosate are being used in several countries to control opium poppy and marijuana production. Several herbicides have been identified that provide excellent control of coca. The extent and nature of the environmental impact from these herbicides under tropical conditions are currently being evaluated. In addition, an extensive crop substitution program has just been completed in Thailand.

Mr. CONTE. Where is the research being done?

RESPONSE. The ARS research program on control of illicit narcotic crops is currently centered at the Beltsville Agricultural Research Center, with projects at other locations as appropriate.

Mr. CONTE. Does ARS work in cooperation on narcotic crop research with foreign government agriculture agencies in any Latin American countries?

RESPONSE. At the present time, ARS is not working with any foreign agriculture agencies in Latin America on narcotic crop research. ARS is working with the U.S. Department of State's Bureau of International Narcotics Matters on the development of coca herbicides. ARS scientists serve as technical advisors to the Bureau.

Mr. CONTE. What projects will the $5 million request for FY 1991 fund?

RESPONSE. The budget increase will be used to expedite all aspects of the ARS research program with particular emphasis on development of biocontrol agents.

Mr. WHITTEN. Several other colleagues have some questions they would like answered for the record.

[The questions and responses follow:]

ONCOGENS

Mr. HOYER. The presence of residues of fungicides, insecticides and herbicides on and in fruit and vegetables is causing a great deal of public concern. The Environmental Protection Agency and the Board on Agriculture of the National Academy of Sciences, have stated that about 53 of the 600 agricultural chemicals are known or suspected oncogens. In fact, the National Academy of Sciences published the list of known and suspected oncogenic pesticides and made a worst case risk assessment for them. Has the Agricultural Research Service modified its programs and developed additional plans to find alternative controls for those pesticides known or suspected to be oncogenic? Please elaborate.

RESPONSE. We have studied the report by the Board on Agriculture of the National Research Council with great interest and concern. In addition to our on going research in biological control, improved cultural practices and development of host-plant resistance, we are developing three comprehensive research Action Plans. These action plans emphasize an increased and highly coordinated effort for developing alternatives to those specific chemical pesticides suspected of being oncogenic. The Action Plans on fungicides and insecticides has been completed and is under internal review. The Action Plan addressing herbicides should be completed in the next month or so. These Action Plans will serve as the basis for additional program modifications in program and new program implementation, where needed, to address the problem. All three plans include components consisting of research on safe chemical insecticides, biological control, host-plant resistance, cultural practices, biotechnology and integrated pest management, and are aimed specifically at developing alternatives to those chemical pesticides identified in the report.

Mr. HOYER. How would you rank the urgency to find alternatives to known or suspected oncogens with regard to fungicides, insecticides and herbicides that are used to protect fruit and vegetables before and after harvest?

RESPONSE. Overall the need to develop alternatives to fungicides believed to be hazardous is more urgent than for the insecticides and herbicides. The loss of the EBDC fungicides in the absence of alternative controls would be catastrophic to fruit and vegetable production and marketing in humid regions of the USA. Nevertheless, the need to develop alternatives for the insecticides and herbicides identified by EPA for review is urgent.

ALTERNATIVES TO CHEMICAL PESTICIDES

Mr. HOYER. Please explain briefly the overall ARS program for discovering and developing alternatives to chemical pesticides which pose significant risks to human health and to the environment. In particular, please identify the major gaps and/or weaknesses in the ARS program.

RESPONSE. The total level of research effort in ARS in FY 1990 on developing nonchemical controls for plant diseases, nematodes, insects and weeds is $40 million involving about 224 scientists. The effort includes research on ecological methods such as eliminating over-wintering hosts, development of varieties that resist pest attack, row spacings of crops and cultural practices that enhance their ability to out-compete weeds, biological control, use of behaviorial chemicals (pheromones, food attractants, etc.) to combat nematodes and insects, physical methods such as reflective mulches to prevent aphids from alighting on crops, hot water treatment against pests on imported fruit, etc.

With regard to program strength, ARS allocates 133.6 SY effort to plant breeding. Roughly one-half of this effort is focused on developing pest-resistant crops. However, the level of effort is very meager or nonexistent with regard to those commodities identified by the National Academy of Science that are likely to have dangerous pesticide residues; namely tomato, apple, peach, lettuce, grape, celery, spinach, and cabbage. With regard to biological control research of weeds, ARS has respectable programs on aquatic and rangeland weeds, but a very meager program on cropland weeds. With regard to biological control of plant diseases, ARS has a respectable effort on soil-borne diseases that attack roots and seedlings. However, the biocontrol research program against plant pathogens to protect the fruit, stems, and leaves is almost nonexistent. With regard to biological control of insects, ARS has a fairly good effort on some of the long-established major pests, but the effort on pests that have come to prominence recently (e.g., sweet potato whitefly) and on specialized approaches (e.g., inundative releases of biocontrol agents) is weak.

Mr. HOYER. Please indicate the number of scientist years of effort on alternative controls that would have to be provided in order to significantly impact on the need within 5 to 10 years. To what extent can this need be met by redirecting resources from the ARS base?

RESPONSE. To mount a meaningful effort to develop nonchemical and integrated controls against plant pathogens that attack fruit, leaves and stems before and after harvest, no less than an additional 25 scientist years or effort would be required. To mount a small pioneering effort on the biological control of cropland weeds would require at least 10 scientist years of effort. The most critical gaps in the biological control of insects could be met with an additional 10 scientist years of effort. We believe that over the next two years, we may be able to redeploy up to 5 scientists years of effort from the base program.

BOVINE LEUKOSIS

Mr. CHAPMAN. I am very concerned about a virus disease of cattle called Bovine Leukemia (also referred to as Bovine Leukosis or BLV). All dairy and beef breeds are suspectible to this virus and I have read reports which indicate that a high percentage of U.S. cattle test positive for the disease. Of those animals infected, not all will exhibit signs of the disease. However, individual producers with animals who do show signs of the disease can experience severe economic losses due to condemnation of carcasses at slaughter, breeding and health problems, and decreased milk production in dairy cows. Furthermore, a major economic impact in the future may be the potential loss of income from exporting U.S. breeding stock to other nations who are increasingly restricting the movement of BLV-infected cattle in international trade. Diagnostic procedures have been developed to detect the presence of this virus, the USDA has approved many laboratories to conduct these tests, and test methods now seem adequate to allow the development of programs to eradicate BLV; however, no vaccine is currently available to produce immunity to this disease, no pharmaceutical companies are actively developing a vaccine at this time, and there seems to be little attempt to study ways to control or eradicate BLV infection. I have a series of questions I would appreciate your responding to in this regard.

First, communications with veterinarians in Northeast Texas alone indicate that approximately 85% of the dairy farms in that area lose cows because of infection with the bovine leukemia virus. Have you studied the number of incidences of this disease nationwide?

If so, could you please provide statistics in this regard?

Response. Although precise estimates of incidence are not available for the entire United States, BLV infection is known to occur nationwide, with highest incidence in the Northeast. The incidence is higher in dairy than in beef breeds. The only available figures on incidences of actual disease, i.e., the development of tumors, are from USDA meat inspection reports. In FY 1988, which is the latest report available, 13,413 cattle were condemned nationwide because of lymphosarcoma.

Mr. **Chapman.** How many countries currently restrict the importation of BLV infected cattle?

Response. With the exception of Canada and Mexico, essentially all importing countries reject U.S. cattle showing serologic evidence of BLV infection.

Mr. **Chapman.** Do you foresee the number of countries that restrict BLV infected cattle increasing?

Response. The number of countries that restrict BLV-infected cattle is not expected to change.

Mr. **Chapman.** Have you studied the economic impact this disease may have in the future due to inability to export infected U.S. breeding stock to other nations?

Response. No studies on the future economic impact have been conducted. It is expected that we will continue to fill the export market for breeding stock, but we may have to test more animals to find sufficient BLV-free cattle for export.

Mr. **Chapman.** Have you or any other division of the USDA studied the need for a vaccine for this disease?

Response. ARS and others have conducted experimental trials with vaccines. However, because death losses due to BLV in a given herd are usually low, it is questionable whether vaccination could be justified from an economic standpoint. In addition, vaccination would complicate the export issue since vaccinated cattle could not be differentiated from infected cattle by available serologic tests.

Mr. **Chapman.** Have you studied the need to develop methods to control or eradicate this infection?

Response. Methods to control and eradicate BLV have been developed. In 1982, the Bluetongue-Bovine Leukosis Committee of the U.S. Animal Health Association proposed a voluntary program for the establishment and maintenance of BLV-free herds. This proposal was endorsed by the Animal and Plant Health Inspection Service (APHIS).

Mr. **Chapman.** Are you aware of what other countries have done on behalf of studying this virus?

Response. The European Economic Community selected BLV for a coordinated research effort from 1976 to 1982. The major emphasis of this research was on developing control and eradication programs. As a result, several European countries, most notably Denmark and West Germany, have undertaken control programs that have been successful in reducing the incidence of BLV infection. Japanese researchers have also been active in basic studies of the virus, particularly on mechanisms of tumor induction.

Mr. **Chapman.** Because this disease is prevalent all across the U.S., could there not be a federal role in providing research and guidance, either for states or individuals, in regards to assisting producers in establishing bovine leukemia-free herds?

Response. As previously noted, APHIS has endorsed a voluntary certification program developed by industry. This program has been adopted by a number of individual herd owners, particularly in the Northeast. In most instances, BLV-free certification has been pursued as part of an export enhancement program.

SWEET POTATO WHITEFLY

Mr. **Lewis.** Dr. Plowman, as I am sure you are aware, the sweet potato whitefly continues to be a major pest problem in the state of Florida. Can you describe for me the ARS program that has been established in order to address the serious problems created by the sweet potato whitefly?

Response. Sweet potato whitefly is a national problem with major impact on tomatoes, cotten, vegetables, ornamentals, and greenhouse crops. In Florida our sweet potato whitefly research is conducted at the U.S. Horticultural Research Laboratory, Orlando. This involves research on the causes of the early ripening syndrome associated with this insect. We are also cooperating with the University of Florida to determine if parasites can be used in control strategies. Controls for infestations in greenhouses are being developed at Beltsville, MD, and Newark, DE. Research at the Western Cotton Research Laboratory, Phoenix, AZ, includes testing of cotton cultivars resistant to the sweet potato whitefly. At Salinas, CA, efforts are under way to develop lettuce with whitefly resistance.

GEMINIVIRUSES

Mr. **LEWIS**. Dr. Plowman, we recently received reports that the geminiviruses have been found to be widespread in the tomato crop and tomato breeding fields in southwest Florida. The spread of this disease has been attributed to sweetpotato whitefly. It has been estimated that this disease will also spread to other vegetables such as beans, eggplant, field crops, and probably ornamentals. Can you tell us in what states and countries this virus is a problem and roughly how great are the losses caused by both the virus and the sweetpotato whitefly?

RESPONSE. The geminiviruses are a group of plant viruses transmitted by leafhoppers, planthoppers, and whiteflies. These viruses and their insect vectors generally occur in tropical and subtropical areas around the world; however, they also occur in more temperate areas. These areas include Africa (Zimbabwe, Congo, Nigeria, Ghana, Chad, Sudan, and Egypt); Australia; the Caribbean area (Cuba, West Indies, and Puerto Rico); South America (Venezuela, Colombia, Ecuador, and Brazil); Europe (England, Belgium. Germany, Romania, and Bulgaria); Israel; Asia (Pakistan, India, Ceylon, Sumatra, Java, Philippines, and Japan); and North America. In the United States, plant diseases caused by these viruses occur in California, Florida, Arizona, Texas, Missouri, Georgia, and Maryland. These viruses infect a wide range of crops, including vegetables (e.g, lettuce, tomatoes, and peppers), grasses, and ornamentals. Crop losses generally occur at the rate of 10-80 percent, with an average of 30-40 percent; however, crop losses of 100 percent have also occurred. Depending upon the crop and location—for example, tomatoes in Florida—the estimated annual value of crop loss due to geminiviruses and their insect vectors (e.g., sweet potato whitefly) is $30-60 million.

SWEET POTATO WHITEFLY

Mr. **LEWIS**. Dr. Plowman, have any satisfactory chemical controls been established to combat the sweet potato whitefly? If not, has ARS made any breakthroughs in effectively controlling this problem?

RESPONSE. The sweet potato whitefly is notorious for its ability to quickly develop resistance to chemical insecticides. Nevertheless, our minor use program at Corvallis, OR, and Charleston, SC, is developing data to support registration of insecticides for control of whiteflies. Some chemical pesticides may emerge that will provide temporary relief to the sweet potato whitefly problem for a duration of several years. We believe that alternative management strategies need to be developed for a long-term solution. These include elimination of weedy plants on which the pest overwinters, biological control, host plant resistance, and cultural practices used in the context of Integrated Pest Management.

Mr. **WHITTEN**. We thank you again. We are on your side. We might not act like it sometimes.

STATEMENT OF DR. CHARLES E. HESS
ASSISTANT SECRETARY FOR SCIENCE AND EDUCATION
BEFORE THE HOUSE SUBCOMMITTEE ON RURAL DEVELOPMENT, AGRICULTURE AND RELATED AGENCIES

Mr. Chairman and members of the Subcommittee, I appreciate this opportunity to present to you our research and extension budget proposals for 1991. First, as many of you know, Dr. Harry Mussman is the Deputy Assistant Secretary for Science and Education. Many of you know Harry from his former service as Administrator of the Animal and Plant Health Inspection Service. Soon after he was appointed Deputy Assistant Secretary, Secretary Yeutter placed him in charge of the Working Group on Water Quality to coordinate our water quality programs Departmentwide. He is serving in that capacity along with his responsibilities as my deputy.

NEW OPPORTUNITIES IN AGRICULTURAL RESEARCH

Mr. Chairman, I am pleased to present to the Committee a research budget that is nearly 5 percent above the 1990 level. Your Committee has been a strong supporter of agricultural research over the years and you have witnessed the revolution in understanding of biological systems. As we enter the 1990's we truly have the opportunity to further, and rapidly apply, our expanding knowledge in plant and animal systems. A recent report of the National Academy of Sciences provides a wealth of information on the possibilities for the application of modern technologies to the agricultural sector. That report, "Investing in Research: A Proposal to Strengthen the Agricultural, Food and

Environmental System", forms the basis for an important component of our budget which I would like to highlight for the Committee.

NATIONAL INITIATIVE FOR RESEARCH

More than a century of research through the land-grant universities and research at our Federal labs has blessed us with a dependable food and fiber supply at reasonable cost and has enabled the United States to be a leading exporter of agricultural products. At the same time, it is increasingly clear that farmers, ranchers and consumers of agricultural products are faced with problems which cannot be addressed with our current state of scientific knowledge. While we have overcome countless hurdles to profitable production through research, we continue to face threats from pests and diseases, drought and other weather extremes and increasing concern that modern farming practices are a potential source of environmental damage. It is imperative that a National effort be launched to solve these problems as the means to retain American competitiveness in world markets, maintain a strong rural economy and make certain that our production practices allow farmers to be good stewards of land and other resources.

Mr. Chairman, we propose to address the need for additional research and extension through a balanced set of program proposals that support our existing Federal and state research system and enhance the ability of all capable scientists to contribute to agricultural research. A new National Initiative for Research on Agriculture, Food and Environment is the centerpiece of our 1991 budget. At a proposed 1991 funding level of $100 million, the Initiative would provide competitively awarded grants for basic and applied research in topics identified by scientists, producer organizations and policymakers as critical to the continued profitability and competitiveness of our agricultural and natural resources sectors. With Congressional support for these proposals, the Administration is committed to annual increases of $50 million for this program of competitively awarded grants.

I have asked Dr. Jordan to provide you with the details of our proposals for the Initiative, but I would like to highlight a few key points for your consideration as the Committee deliberates on the request. First, I want to emphasize that the Initiative will fund research which has as a central focus the development of solutions to agricultural and related problems--those faced directly by producers and consumers of food and fiber. Certainly, some of the work will be basic science that, at first glance, might appear only remotely related to problems in the field. It is this work, however, that will provide the underpinning for applied projects to develop specific solutions, and it is in this area that researchers and producers increasingly recognize a need for greater progress.

Second, while the program will fund a strong component of basic science, funds will also be available for "applied" research to translate science into solutions. Certain projects will be carried out through multidisciplinary teams as a means to bring an appropriate range of talents to bear on specific issues. For example, with a multidisciplinary approach, we can bring the talents of soil scientists, weed scientists, entomologists and others together to develop improved, sustainable production systems with benefits for the environment and producer profitability.

Third, we recognize that the scope of the research to be conducted requires the availability of a broader range of talent than has traditionally been strongly represented in the competitive grants programs. Certainly, the proposed increase in the size of the program would have the effect of involving more institutions, but we believe that specific steps should be taken to assure that institutions across the spectrum are full contributors to solving problems in agriculture. Therefore, we have included provisions to strengthen the capability of traditionally less competitive institutions to compete for grants through the program. Our proposal is to make ten percent of funds available for these strengthening grants.

Finally, I would note that we intend to administer the Initiative through a Board of Directors composed of the Assistant Secretary for Science and Education and the administrators of the Agricultural Research Service, the Cooperative State Research Service, the Extension Service, the National Agricultural Library, the Forest Service, the Economic Research Service and the Chief Scientist of the Competitive Research Grants Office. This structure will assure coordination with the ongoing programs of agricultural and natural resources research. Extension representation on the Board will assure a direct feedback from users of research to keep a sharp focus on needs at the technology transfer level. This is only an overview of our proposal and we look forward to working with the Committee on this important proposal.

SUPPORT FOR ONGOING PRIORITIES

Success of the Initiative and all of our proposals rests on the strength of the system of agricultural research we have developed over the years. It is the readiness of this system to tackle problems of a National and regional nature that has enabled American agriculture to overcome challenges and remain profitable. We recognize that any plan that does not provide adequate support for this research base will not be successful in the long term. Therefore, increases are proposed for the Hatch Act and 1890 Institutions programs to help these institutions offset increased expenses and retain the capability to compete for grants in priority areas. In addition, our request includes $25.6 million for special grant programs to continue priority National interest grants. Dr. Jordan can provide additional details.

Our Federal labs represent a significant part of the base program of agricultural research. We look to ARS particularly to conduct research in areas of National interest, which generally requires significant commitments of resources over many years. Prime examples of this type of work include animal disease and plant and animal germplasm programs. ARS maintains the Nation's base collections of plant germplasm and we are proposing increases to strengtnen that program, which is operated to the benefit of all performers of agricultural research. It is the immediate availability of that extensive collection which provides the basis to quickly address new pest and disease problems, such as the Russian wheat aphid and allows breeders to incorporate value-added traits into varieties. In this regard, I also want to emphasize my strong support for the request of $4 million which we need before we can initiate construction of the new Seed Storage Lab in Fort Collins. The existing lab is literally bursting at the seams and any delay would place at serious risk an irreplaceable National genetic resource. I urge your support of our modest request for full funding for this project.

ARS's long experience in the germplasm area places the Agency in a unique position to manage a program of plant genome mapping for which funds are included in the research Initiative and in the ARS budget. It is a successful plant genome mapping effort which will truly make our genetic collections most useful to geneticists who will have the ability to quickly transfer identified genes into desired species. Mr. Chairman, we are in an exciting era in research, with new tools available to researchers only imagined a few years ago. Benefits will accrue only if we seize this opportunity to invest for the long term.

Issues in food safety are increasingly in the forefront of concern among consumers of agricultural products, both in domestic and foreign markets. The aflatoxin situation exacerbated by last year's drought caused concern among foreign buyers of American grain. American consumers are concerned with food safety issues ranging from mycotoxins and microbial contamination to pesticide and drug residues. In view of increasing recognition of the potential dangers, farmers need to be provided with the means to eliminate these hazards from products, and advances in science will provide regulatory agencies with new approaches to speed the analytical basis to detect these problems. Our budget includes a proposal to increase ongoing ARS programs in these areas by $10.8

million in conjunction with a broader food safety initiative being proposed by the Department.

PROVIDING ADEQUATE RESEARCH FACILITIES

A final note in my comments on the ARS budget. Scientific advancement will come only with the appropriate resources--and that includes physical facilities in addition to the scientists inside those facilities. As the Committee is aware, many of our Federal agricultural research facilities are 30 or more years old--the four major utilization labs are celebrating their 50th anniversaries this year. ARS has embarked on a plan to upgrade all its facilities to meet basic codes, with broader modernization efforts targeted at the highest priority labs. In addition to the Seed Storage Lab project I mentioned, the Agency is proposing $28.6 million for three other construction projects. Funds would be provided for additional modernization at Beltsville, Maryland, a replacement fruit and vegetable lab in Yakima, Washington, and an addition to the poultry research lab in Athens, Georgia. Each is important for specific reasons which the Agency will discuss, and all are critical to our ability to conduct the most advanced research to solve specific problems. Certainly, it is difficult to commit large blocks of resources to individual projects in these constrained budget times. But I must emphasize that we cannot begin construction until full funding is approved and an obligation can be made for the full project. Mr. Chairman, I look to your leadership in assuring that these priority projects are fully funded to avoid costly delays from the standpoint of time and dollars lost to cost escalation.

DEVELOPING SCIENTIFIC TALENT

Challenges we face in agriculture demand a highly skilled workforce with an understanding of agricultural and natural resource sciences. At the same time, we have witnessed declines in the numbers of students choosing these as major fields of study. Of particular concern is the need to increase the diversity of students in agriculture. Much has been said about these concerns, but it is essential to provide resources to effect a positive change. Mr. Chairman, I am pleased to present a budget with increases in most of our major higher education programs, including the 1890's Capacity Building Grants program being initiated in 1990 with the support of your Committee. Along with an increase in Federal funding, we are proposing a full matching requirement, building on an indication that there is a favorable response to matching as encouraged by the Committee in the 1990 program.

PLACING SCIENCE IN ACTION THROUGH TECHNOLOGY TRANSFER

Our best science is a failure if it remains on the shelf. Certainly, our history of success in applying agricultural research can be attributed largely to an effective system of technology transfer and education, primarily through the Cooperative Extension System. Just as the basic research system is important, we consider support for base extension programs to be a high priority and we have included increases for the basic Smith-Lever and 1890 Institutions formulas to help offset higher costs. In addition, we are proposing targeted programs to support meritorious projects in the highest National priorities. This combination reaffirms the Federal commitment to the partnership while helping local Extension personnel address issues which the Nation faces as a whole.

Building on the base initiated with your support in the 1990 budget, we are proposing a $10.3 million increase for water quality education in coordination with the President's initiative. Additional funds will allow Extension to continue projects to demonstrate environmentally-sound, profitable farm and ranch management practices begun during 1990 and expand those programs to reach producers in more areas. Working closely with the Soil Conservation Service, Extension will initiate comprehensive programs in 37 additional hydrologic units and eight new demonstration areas. Funds are also requested to assure that field level Extension personnel are fully trained to effectively deliver the programs.

A NEW ROLE FOR EXTENSION YOUTH PROGRAMS

Extension has a long history of working with youth--developing leadership and citizenship qualities, providing practical education in nutrition and agriculture and other areas. In recent years, certain state Extension programs have begun to address concerns with youth at risk--children who are at risk of failure because of inadequate supervision (e.g. latchkey children, single parent families), poverty, presence of drugs in neighborhoods and other factors. There is a need to bring a National focus to these programs and provide a stable commitment of resources to develop the highest quality programs in targeted areas. Extension proposes $10 million for grants to support comprehensive and intensive programs including significant efforts on early childhood development. A key aspect of the programs is a requirement for full matching with state or private resources with a further 50 percent match at the local level to assure the full involvement and commitment of local leaders to the projects. The proposal has received full support within the Administration and I look to the Committee to support this important request which will target a serious National problem.

STRENGTHENING AGRICULTURAL INFORMATION PROGRAMS

America is clearly a leader in many fields of science, but increasingly foreign scientific developments are advancing the cutting edge of scientific investigation in a broader range of fields. We cannot afford to slip behind as a result of not keeping pace of these developments. However, important foreign scientific literature is becoming expensive because of exchange rate fluctuations and the inflation in scientific literature costs which is well above general inflation rates. We look to the National Agricultural Library to provide the base collection of literature in the agricultural and related sciences. We are proposing increases in the NAL budget to offset the effects of inflation on acquisition of scientific literature and to continue funding the development of a network of agricultural collections. NAL and the university libraries can achieve savings through a cooperative network by avoiding duplication in a number of basic library functions and by relying on special collections at certain institutions through sharing arrangements.

CLOSING REMARKS

Mr. Chairman, as my first year as Assistant Secretary comes to a close, I am impressed with the dedication and talent of the research and extension professionals and inspired by the challenges we face. We clearly have the opportunity to bring the most advanced technologies to bear on long term and emerging challenges in the food and agriculture sector. It will demand a commitment of new resources and a clear focus on the highest National priorities. We worked hard on developing our program and budget proposals and now we look forward to working with the Congress to achieve our shared desire to advance American competitiveness and profitability for farmers and ranchers. This concludes my prepared remarks. I will be pleased to respond to questions from the Committee.

AGRICULTURAL RESEARCH SERVICE

Statement of Dr. R. Dean Plowman, Administrator, Agricultural Research Service, United States Department of Agriculture, before the Subcommittee on Agriculture, Rural Development, and Related Agencies.

Mr. Chairman, Committee members, and staff. Today, I will report on the overall state of the Agricultural Research Service (ARS). I will review the progress we made during the past year and highlight our concern for the future. And, of course, I will present and explain our program and budget recommendations for the coming year.

THE STATE OF THE AGRICULTURAL RESEARCH SERVICE

As you know, the mission of ARS is to conduct research to solve problems encountered by agricultural producers and consumers of farm and ranch products. We have completed a successful year. Included in the accompanying Explanatory Notes are more than 60 examples of important research completed last year in the plant and animal sciences, natural resource conservation, post-harvest applications, and food safety and nutrition.

For the record, here are what I consider to be our most important achievements last year:

— ARS delivered the WEPP (Water Erosion Prediction Project) computer model, which estimates erosion on agricultural lands, to the Soil Conservation Service, Forest Service, and Bureau of Land Management for field testing. This model will help farmers produce crops without excessive erosion. It will also help us better understand the long-term impact of erosion on soil productivity and water quality.

— ARS scientists, in cooperation with Iowa State University and the University of Illinois, imported 144 Chinese pigs of three unique breeds. These Chinese breeds will be crossed with U.S. breeds to increase litter size, and still maintain the lean yield and quality of U.S. pork.

— Our engineers developed an objective method for evaluating wheat hardness. This is essential to grading wheat by the Federal Grain Inspection Service as well as the orderly marketing and exportation of this commodity. This new method provides the first objective nationwide evaluation of wheat hardness, and it can be used to develop data on the effects on hardness of variety, growing conditions, and environment.

— Using sperm separation techniques, our animal scientists predetermined the sex of rabbit and swine offspring with at least 75 percent accuracy. This breakthrough moves us closer to a practical method for controlling the sex of livestock.

— Ambersweet, a new orange hybrid developed by ARS scientists, was released for commercial planting. It appears to be cold hardy and therefore could be a major factor in helping Florida growers recover their markets after freezes such as we had this winter. Juice from this hybrid exceeds color standards for Grade A juice and can be mixed with other domestic juices that don't quite make that grade.

— Fluffy cellulose, a patented, high-fiber, non-caloric food additive developed by ARS scientists, was named one of the year's top 100 commercialized inventions by the prestigious Research and Development magazine. Fluffy cellulose is used in bread and pastry. It has been licensed to two firms which manufactured it in rural midwestern communities.

— ARS researchers have isolated strains of a natural soil microorganism that suppresses wheat take-all disease. Take-all has become the Nation's most damaging wheat root disease, affecting up to 13 percent of all wheat crops in the Pacific Northwest. At least three major biotechnology firms are considering commercializing this discovery.

There are other ways in which we can assess the state of the Agency: progress in renovation and construction of facilities, support of action agencies, and employee productivity.

A major study of needs at our Beltsville Agricultural Research Center, the Agency's largest laboratory complex, is nearly complete. It has identified several necessary alterations and new construction projects. Additional funds for these projects are requested in the 1991 budget, and I will discuss these in more detail later. In 1989, we dedicated a major new laboratory--the Plant Molecular Biology Laboratory--and established a new Climate Stress Laboratory at Beltsville. We are proceeding with renovations using money appropriated by Congress last year.

We have other progress to report from last year, most notably the completion and dedication of our new Soil Tilth Laboratory at Ames, Iowa.

Facility renovation and construction continue to be among our highest priority needs, and I will address this matter later in my statement.

I have already mentioned two very important research products that ARS scientists delivered to action agencies. There are other examples, including these:

(1) Lactose--milk sugar--added to poultry drinking water reduces the incidence of Salmonella infection in chickens. This discovery directly supports the work of the Food Safety and Inspection Service.

(2) New tools for more accurate, more effective detection of brucellosis and anaplasmosis have been found to directly support the Animal and Plant Health Inspection Service (APHIS).

Finally, Mr. Chairman, I believe there has been significant improvement this past year in the skills, productivity, expertise, and capabilities of scientists, support personnel, and managers throughout the Agency. I have sensed a strengthening within ARS that results from the hard work, a feeling of accomplishment, pride in the organization, and a sense of realizing one's full potential among our employees.

For all of these reasons, I am comfortable in asserting the fundamental soundness of the Agricultural Research Service.

MAJOR CONCERNS

Yet concerns remain. Chief among these is the need to continue support for our core programs that are significant and critical to American agriculture but that fall outside today's newly identified priority needs. For several years we have been able to adjust our activities and retain support for these important programs through improved operating efficiencies, by terminating less important research, and by closing more than 31 locations since 1979. Now, because of the continued need to preserve these important core programs and to retain our responsiveness to address emerging, more complex and costly requirements we need to make additional adjustments. We can no longer do everything we are doing, and we want to continue doing only research that we can do thoroughly and well.

I have asked my staff to analyze and prioritize our entire program and as circumstances and opportunities arise we will make some adjustments. The highest priority research will be preserved. Naturally, we will advise the Committee of our intent before actions are taken.

FY 1991 BUDGET RECOMMENDATIONS

The ARS program budget request for FY 1991 is $623,510,000, or 6.4 percent over the current fiscal year. We have asked for specific increases in three major areas: environmental quality, food quality and safety, and efficiency and profitability of farming. The building and facilities request is for $32,600,000.

ENVIRONMENTAL QUALITY (+$14,815,000)

This increase will fund research in two areas of national concern--groundwater contamination and global change.

We will conduct research to understand and minimize the impact of agricultural chemicals on our water resources. This research is an integral part of the Presidential Initiative on Enhancing Water Quality. We will emphasize studies of chemical and biological degradation, mobility and leaching, and volatilization and plant uptake of agricultural chemicals. We will develop crops that use nitrogen fertilizer more efficiently, thereby minimizing potential nitrate pollution. Research on the movement of chemicals in soil will stress development of better farming strategies.

We also need to evaluate both the impact of projected global change on agriculture and whether agriculture contributes to global change. The proposed research will focus on physical, chemical, and biological processes linking agriculture and global change. Our intent is to ensure maximum agricultural productivity with minimum environmental impact.

FOOD QUALITY AND SAFETY (+$15,800,000)

The quality and safety of America's food supply have never been better. Paradoxically, however, people have become more sensitive to perceived hazards in their food. Research to enhance food quality and safety for the consumer will focus primarily on the priority needs of the Department's action and regulatory agencies. This will include more efficient, less costly tests for detecting harmful microorganisms and chemical residues in food. We will also continue to develop biological controls and other alternatives to synthetic pesticides, devise production systems that minimize potential contamination, and explore ways to reduce risks from mycotoxins such as aflatoxin.

Also, we are proposing $5 million for research to expedite development of environmentally sound control agents for the eradication of illicit narcotic crops.

EFFICIENCY AND PROFITABILITY OF FARMING (+$9,074,000)

Our budget request includes new funding for the Plant Genome Mapping Program. This is USDA's plan for mapping desirable genes in major food and forest crops. Our international trade competitors already are aggressively pursuing plant genome mapping. The ability of American agriculture to meet 21st-century challenges will depend on investments made now.

Down the road, we expect to use the knowledge we gain about the plant genome to alter plants for many important functions—from drought-stress resistance to food safety, from food to nutritional content. ARS is managing the program in close cooperation with U.S. universities and private industry.

In addition to this new funding, ARS will also administer $15 million in competitive grants for genome mapping. This amount is included in the Cooperative State Research Service budget under the National Research Initiative proposal.

We will increase our efforts to acquire, maintain, evaluate, and enhance plant germplasm in concert with the Cooperative State Research Service. This program ensures long-term diversity of economically important crops and provides an essential resource for plant breeders and geneticists. This program will pay dividends well into the 21st century.

Our animal science research will continue to be focused on economically important diseases of livestock and poultry. New research will concentrate on animal germplasm preservation, characterization, inventory, and management. This program will ensure that we maintain the diversity of our food-producing animals.

We are also requesting $5,448,000 which represents 50 percent of the 1991 pay raise.

BUILDING AND FACILITIES (+$32,600,000)

The need for modern research facilities is critical. Some ARS facilities are 30 years old or older. A few need major renovation to provide state-of-the-art laboratories for high-quality scientific research and to bring us in line with current employee health and safety standards.

The FY-1991 budget recommends $30.1 million to complete projects partially financed in the FY-1990 appropriation, and $2.5 million for a high-containment poultry facility. Specifically, proposals are:

1. Again this year, our highest priority need is the new National Seed Storage Laboratory at Fort Collins, Colorado. This facility is critically important to farmers nationwide and to the long-term health of U.S. agriculture. We again seek full funding this year. To date, Congress has provided $1 million for planning and $8,250,000 for construction. The proposed increase of $4 million would enable us to begin construction, which can't be started until the entire package is fully funded.

2. The Beltsville Agricultural Research Center (BARC) would receive $16 million for the continuing modernization of facilities there. Most of the major ARS facilities and utility support systems at BARC date from the 1930's and 1940's, and they are clearly inadequate for today's needs. Earlier, I mentioned some of the progress made to date. Details of this proposal are provided in the Explanatory Notes.

3. A new Fruit and Vegetable Research Laboratory in Yakima, Washington, would be funded for construction at $10.1 million. Thus far, Congress has provided $1 million for planning and designing this new facility and $1.9 million for construction. This new facility would support research on the biology, ecology, and control of insect and mite pests on deciduous fruits, vegetables, and field crops. This facility becomes especially important for producers in light of the Environmental Protection Agency's pesticide reviews. Again, we cannot begin construction until the project is fully funded.

4. An addition to our Poultry Disease Laboratory at Athens, Georgia, would be funded at $2.5 million for planning, design, and construction. This addition remains a high-priority need. It is necessary for cost-effective research on avian influenza, Salmonella, and the potentially threatening exotic Newcastle disease. The poultry industry has pledged substantial funding towards the structure.

Mr. Chairman, my staff and I are available to respond to your questions.

AGRICULTURAL RESEARCH SERVICE

Actions in Response to Congressional Directive (1990)

1. Aflatoxin Research. Provide $750,000 increase for aflatoxin research.

   Research will address prevention of preharvest aflatoxin by seeking to develop resistant germplasm and/or biocompetitive approaches to control aspergillus flavus. ARS is working with industry representatives of corn, cotton, peanuts, and nut trees to establish this program.

2. Agricultural Research and Development Cooperatives. Continue $2 million grant to the Peoria, Illinois, consortium for furthering commercialization of agriculturally-related products.

   Research for furthering commercialization of agriculturally related products will be continued at $1,953,000, which reflects the Gramm-Rudman cuts.

3. Alternative Fuels. Provide $25,000 increase for research on ethanol production.

   The funds will be used in cooperation with Arkansas State University for research on ethanol production.

4. Staffing at the University of Arkansas, Fayetteville. Locate two ARS poultry and two food safety scientists at the University.

   ARS has completed its joint study with the University of Arkansas on the four positions. We plan to locate the two food safety scientists at Fayetteville sometime in FY 1990. As resources permit, the remaining two poultry scientists will be located at the University.

5. Animal Germplasm. Provide $900,000 increase for research on animal germplasm preservation and evaluation.

   The increase will be used for the evaluation of the reproductive, growth and carcass traits of different biological types of beef cattle in a subtropical environment; the development of methods to freeze embryos and embryonic cells and sperm populations for long-term storage; the purchase of equipment; and the initiation of a national inventory system for animal germplasm.

6. Bacterial Contamination. Provide $700,000 increase for research to reduce bacterial contamination in meat animals.

   The increase will be used to develop a means to assess the levels of bacterial contamination in cattle, sheep, and swine; establish interactions between bacterial contaminants such as salmonella with other domestic diseases of livestock; expand current efforts on sources and transmission of Salmonella enteritidis in poultry; develop means to reduce the carrier state of zoonotic E. coli in livestock and identify factors which enable E. coli and selected E. coli strains to colonize the intestinal tract of healthy cattle.

7. Bacterial Contamination and Pesticide Residues in Meat, Dairy, and Grain Products. Provide $2,350,000 increase with $500,000 set aside for a cooperative agreement with the Mississippi Center for Food Safety and Postharvest Technology.

   The increase will be utilized in support of research in the areas of detection and prevention of bacterial contamination and minimize the use of toxic chemicals and pesticide residues at the following ARS locations:

   Athens, Georgia - develop methods to prevent Salmonella infection in newly hatched chickens by treating embryos in the egg before hatching.

   Athens, Georgia - address the problem of Fusarium moniliforme infection of corn which now results in the production of fumonisins toxic to animals.

   Beltsville, Maryland - address the problem of rapid, efficient detection of bacterial contamination and septicemia in poultry presented for slaughter, and specifically to determine whether reflectance photometry can identify abnormal broiler carcasses in the laboratory.

   College Station, Texas - develop methods to control Salmonella infection in live poultry to prevent human infections from eating contaminated poultry products, and to utilize anaerobic bacteria as an adjunct to dietary sugars to prevent Salmonella infection in poultry.

   Peoria, Illinois - investigate the interaction of aflatoxin producing fungi and bacteria with the host plant corn in order to develop new control strategies which will prevent aflatoxin in corn and which will minimize use of toxic chemicals.

Philadelphia, Pennsylvania - develop product safety criteria for non-homogenous products, in particular to determine (1) the effect of different components on moisture levels at the interface in multicomponent products, such as shelf stable sausage products containing cheese; (2) the effect of different components on the microbial environment at the interface, and (3) the most appropriate means of controlling conditions at the interface to promote product safety.

Mississippi - ARS is currently developing plans with Mississippi State University for establishing program direction and priorities in methodology for detection and quantitation of chemical and microbiological contaminants at the Center for Food Safety and Postharvest Technology.

8. Barley Research. Provide $100,000 increase for support of a barley cytogeneticist at Aberdeen, Idaho, and a barley biotechnologist at Fargo, North Dakota.

These funds have been made available: $50,000 each, to the barley cytogenetics project at Aberdeen, Idaho, and to the barley biotechnology project at Fargo, North Dakota.

9. Bee Research. Continue research on nonapis pollinators of alfalfa.

ARS is continuing to cooperate with regional universities on this problem. The Pollination Research Advisory Committee of the Northwest Alfalfa Seed Growers Association is involved. The Bee Biology and Systematics Laboratory, Logan, Utah, coordinates this research which emphasizes work on larval mortality factors.

10. Bee Research. Continue research on control measures for Varroa Mite infestation in domestic bee colonies.

This research continues to be performed at the Beneficial Insects Laboratory, Beltsville, Maryland, and the Honey Bee Breeding, Genetics, and Physiology Research Laboratory, Baton Rouge, Louisiana.

11. Repair and Renovation, Beltsville Agricultural Research Center (BARC). Provide $7,250,000 for essential repair and renovation work at BARC. Funds will be used to accelerate current renovation of the 50-year-old facility and will "remain available until expended" for efficient fund utilization. Also, provide $300,000 increase for initial work in connection with the reconstruction of Powder Mill Road.

These funds will be used to continue the renovation and construction of facilities at the Beltsville Agricultural Research Center.

The increase of $295,800, after sequester, will be used for the reconstruction of Powder Mill Road.

12. Blueberry/Cranberry Research. Provide $50,000 increase for research at Poplarville, Mississippi.

    Funds will expand existing blueberry research at this location, with emphasis on development of new and improved cultural practices, new and improved varieties indigenous to the Gulf States, and control of disease pests.

13. Center for Applied Aquaculture Research and Training, Oceanic Institute, Hawaii. Provide $463,000 increase for the acquisition of fixed and movable equipment to make the Center operational.

    The funds will be used to purchase equipment to make the Center operational.

14. Cotton Ginning and Crop Simulation Research. Provide $600,000 increase for cotton ginning research at three existing laboratories in Texas, New Mexico, and Mississippi (split equally). In addition, provide $250,000 to the Computer Crop Simulation Program in Mississippi.

    $200,000 has been allocated to the three Ginning Laboratories. These funds will be utilized to increase the research on cotton quality improvement, including automated control of the ginning process.

    $250,000 will be allocated to Mississippi State to provide research support to the ongoing GOSSYM/COMAX Information Unit for use in developing decision-aid models for cotton growers.

15. Dairy Forage Research Center, Madison, Wisconsin. Continue research in developing better ways to utilize alfalfa and other forages.

    Research to develop better ways for dairy cattle to utilize alfalfa and other forages and reduce the cost of producing milk will be continued.

16. Diagnostic Methods for Diseases of Livestock and poultry. Provide $1,500,000 increase for research on diagnostic methods for diseases of livestock and poultry.

    Funds will be used for leptospirosis in swine, Johne's disease in cattle, and respiratory coronavirus in swine; identification of genes to enhance disease resistance and immune response in poultry; identify arthropod vectors responsible for Lyme disease; and develop protective antigens for Coccidia in poultry.

17. National Animal Disease Center Consortia Grant, Ames, Iowa. Provide $88,000 increase for grant to establish a R&D cooperative agreement among this Center, the Center for Immunity Enhancement at Iowa State University, and at least 10 private companies for the purpose of furthering commercialization of new and advanced animal health products.

    The cooperative agreement involving all members of the Animal Health Research Consortia is being established.

18. Dwarf Bunt Research in Wheat. Continue research to eliminate dwarf bunt in Michigan wheat.

    ARS will continue its research on dwarf bunt disease of wheat at Aberdeen, Idaho, Pullman, Washington, and East Lansing, Michigan. The research at Aberdeen and Pullman will develop and evaluate host resistance to dwarf bunt disease. The research at East Lansing will identify sources of resistance to the pathogen in wheat accessions, and development of serological and molecular probes to monitor the ecology of the pathogen.

19. Food Toxicology. Continue research in this area and provide $60,000 increase.

    ARS is currently developing plans for this year's toxicology and related food safety research projects with leaders of the Toxicology Center at Michigan State. These research projects will address problems of mycotoxins, plant poisons, analysis of residues, and the effect of cooking and other treatments on the identity and amount of residues.

20. Fruit Research. Provide increased attention tc the fruit research work at Wenetachee and Yakima, Washington.

    ARS has ongoing commitments to important research at these two facilities. ARS has developed a close working relationship with the Northwest Fruit Industry. Program reviews were held at Yakima and Wenatchee in FY-89

21. Fruit Fly Eradication, Hawaii. Provide $475,000 increase for continuation of fruit fly eradication experiment in Hawaii.

    The increase will be used to support a pilot test to eradicate the Mediterranean Fruit Fly from Kauai/Niihau with the use of the sterile insect technique.

22. Human Nutrition Research Center at Baylor University. Provide $1,500,000 increase for Baylor.

Funds will be used to expand research on (1) energy requirements of infants, children, and adolescents, (2) protein and amino acid needs for normal pregnancy and lactation, (3) effect of dietary lipids and carbohydrates on cholesterol synthesis in young children, and (4) stable isotope labeling of plant food components for utilization studies in young children and pregnant women.

23. Human Nutrition Center at Tufts University. Provide $400,000 increase for Tufts.

Funds will be used to expand research on (1) effects of antioxidant and pro-oxidant substances in food on immune function and other health parameters and (2) the role of vitamin B-12 and folate deficiencies on declining cognitive function and behavioral changes in the elderly.

24. Western Human Nutrition Center, San Francisco, California. Provide $300,000 increase for the Western Nutrition Center.

Funds will be used to expand research on the effects of dietary lipids on risk factors for chronic diseases.

25. Beltsville Human Nutrition Center, Beltsville, Maryland. Provide $400,000 increase for Beltsville Nutrition Center.

Funds will be used to expand research on (1) individual differences in dietary energy utilization and ability to maintain desirable healthful body weight, (2) developing appropriate methods for measuring the content of carotenoids and dietary fiber components in foods, (3) determining the effect of dietary stearic acid on blood clotting, and (4) further determining the value of an improved assay for mutagens in foods and other substances.

26. Grand Forks Human Nutrition Center, Grand Forks, North Dakota. Provide $400,000 increase for Grand Forks Nutrition Center.

Funds will be used to expand research on (1) role of boron and magnesium in bone mineral deposition in animals and prevention of osteoporosis and fractures in aging humans, (2) determine in an animal model the mechanism by which low copper intakes lead to physiological changes associated with coronary artery disease and (3) effect of dietary zinc level on these changes.

27 Human Nutrition Research Centers (all locations). Allow use of conference rooms and other facilities for graduate students in nutrition and health sciences as long as such use does not interfere with the Centers' ongoing research programs.

The ARS recognizes the need for training in nutrition related biological research and the unique opportunities for such training in each of its human nutrition research centers. ARS encourages the hiring of graduate students and post doctoral researchers in the conduct of its research. Conference rooms and other facilities of the centers are regularly used for relevant graduate student programs when such use does not interfere with the centers ongoing research.

28. Kenaf Research. Provide $325,000 increase for kenaf research at Mississippi State University, and $75,000 increase for an ARS program at Texas.

The increase of $325,000 to Stoneville, Mississippi, will be used for a cooperative agreement with Mississippi State University. Objectives of the research are to: (1) develop kenaf germplasm with improved yield, fiber quality, and resistance to nematodes, insects, and diseases; and (2) develop more efficient cultural practices for growing and harvesting kenaf.

The increase of $75,000 will be provided for inhouse research at Weslaco, Texas. Research objectives are to: (1) develop higher yielding, disease, and insect resistant germplasm with improved fiber-pulp characteristics; and (2) develop more efficient cultural practices for growing kenaf and developing the information needed for clearance of chemical pesticides for use on kenaf.

29. Kimberly Research Station, Kimberly, Idaho. Purchase up to 120 acres of land at the research station.

The property consisting of 80 acres at the Kimberly Research Station is being appraised and the purchase will be considered when appraisal is completed.

30. Low-Input Agriculture. Provide $200,000 increase to expand low-input farming and minimum tillage work now underway at the ARS Research Station in Morris, Minnesota.

The research station at Morris has developed a research plan to quantify climate and cropping/management effects on infiltration and quantify soil compaction, weed competition, fertilizer use, crop selection and plant stress on crop productivity and water quality. The funding will also be used to synthesize a user model which will prescribe the degree to which inputs can be decreased without decreasing net returns. A program analyst, hired in FY-89, will provide the needed technical transfer work.

31. Meadowfoam Research. Continue research on meadowfoam.

Research on meadowfoam is being continued at the Northern Regional Research Center, Peoria, Illinois, on commercial applications of meadowfoam oil and, in conjunction with Oregon State University, on agronomic development of the crop toward higher yields of oil/acre.

32. Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska. Provide 250,000 increase to assist in staffing the Animal Health Unit and $150,000 increase to expand and equip the swine research facilities at the Meat Animal Research Center.

Animal Health. The increase will be used to develop an epidemiology project to assess the presence and movement of diseases within cattle and swine herds and sheep flocks. The information obtained will provide information for risk assessments for animal and plant health inspection programs for control and eradication of domestic diseases.

Swine Facilities. The increase will be used to expand and equip the swine facilities at the Meat Animal Research Center for research programs on genetics, nutrition, reproduction, safety and quality of pork products, and diseases.

33. Buildings and Facilities. Modernization efforts being undertaken by ARS to upgrade its facilities are expected to be supported by economic analysis and that consideration will be given to complete internal rebuilding of existing facilities, to demolishing or abandoning existing structures, and to building new facilities, which ever is most feasible.

A study on the modernization of facilities was completed and recommended there be an upgrade of some of the present buildings and a demolition of others, and new facilities be erected depending upon the present condition of the building.

34. Morris, Minnesota. Within the funds available at the ARS facility at Morris, a systems analyst be added to the staff in order to make research more usable to farmers and livestock producers.

A program analyst has been employed to develop models which will enable farmers to calculate how much they can decrease inputs without reducing net returns.

35 Muscadine Research. Continue muscadine research with particular emphasis focused on crown gall disease.

ARS will continue research on adaptability and culture of muscadine grapes and cooperative research with Mississippi State University on crown gall disease.

36 Mycoplasma Research. Provide $100,000 increase for research on mycoplasma, a highly contagious avian respiratory disease.

The increase will be used at the South Central Poultry Research Laboratory, Mississippi State to develop a rapid diagnostic test for avian mycoplasma and to identify a means to prevent production losses caused by mycoplasma.

37 National Arboretum. Continue to use the $750,000 provided in FY 1989 for essential repair and improvement work at the National Arboretum, such as roof repairs, replacement of water lines and electrical systems.

These funds will continue to be available on a recurring basis to the National Arboretum for essential repair and maintenance, and other improvement needs.

38. National Sedimentation Laboratory, Oxford, Mississippi. Maintain the cooperative effort between ARS, SCS, and the Corps of Engineers on the work now underway on the Yazoo Basin demonstration project. Also, continue close working association with the Computational Hydroscience and Engineering at the University of Mississippi on erosion control demonstration program.

The ARS continues to maintain a strong collaborative effort with the Soil Conservation Service and the U.S. Army Corps of Engineers in support of the Yazoo Basin Demonstration Project. Major thrusts of the current work by ARS include (a) before and after assessment of the effects of conservation measures on water quality and aquatic ecology, (b) evaluations of the effectiveness of channel erosion control structures on sediment yields, (c) release to collaborating agencies of new information on the movement of coarse sediments from the Goodwin Creek research watershed, and (d) field evaluation of farming systems that reduce runoff and erosion.

ARS provides space to 13 SCS professionals associated with the cooperative effort. A specific cooperative agreement is being used to transfer funds to the Center for Computational Science and Engineering at the University of Mississippi.

39. National Soil Tilth Center, Ames, Iowa. Provide $500,000 increase for necessary operating expenses of the National Soil Tilth Center.

The increase will be used to meet the cost of utilities, repair and maintenance, janitorial service, and other indirect costs.

40. New Nonfood Uses. Initiate and make substantial progress toward the reallocation of no less than $50 million of the ARS budget to research on new nonfood uses for traditional food commodities such as wheat, corn, and soybeans, as newly appropriated and previously committed funds become available. Submit report to Congress on progress in achieving objective no later than April 30, 1990.

ARS is moving aggressively toward this goal through a planning process involving reallocation of base funds and selected budget increase requests. Novel products and processes to enhance commodity utilization are being targeted. By April 30 a full report of the planned activities will be provided to Congress.

41 Northern Great Plains Research Laboratory, Mandan, North Dakota. Provide $200,000 increase for research in developing new techniques for conservation tillage.

Funds will be used to strengthen existing research program, particularly in the area of conservation tillage cropping systems for efficient water and nitrogen use and erosion control.

42. Oat Research. Provide $100,000 increase to enhance oat research activities at the National Small Grains Germplasm Facility in Aberdeen, Idaho. Also, $100,000 increase for a scientist position at the Department of Cereal Science and Food Technology at North Dakota State University.

Allocations of $100,000 each have been made to Aberdeen and Fargo. A new project is being established at Aberdeen to support the enhancement of oat germplasm. A new project for the advanced study of fiber improvement in oats is being established at Fargo and an additional scientist will be hired for the project.

43. Oregon Research Facilities. Continue ARS commitment to three Oregon research facilities in Burns, Corvalis, and Pendleton.

ARS plans to continue research activities at all three facilities in Oregon.

44. Pea and Lentil Research. Continue pea and lentil research at current levels in the Pacific Northwest. Also, maintain position of full-time geneticist at Washington State University working on critical genetic mapping on dry peas and lentils.

ARS plans to continue research on peas and lentils which are important for use in crop rotation with other crops and for export markets. The ARS geneticist hired in FY 1989 will continue to work on genetic mapping of these crops in cooperation with Washington State University.

45. Peach Research, Kearneysville, West Virginia. Provide $150,000 increase for research related to the genetic manipulation of fruit and pest resistance and quality improvement.

    ARS plans to use the increase at Kearneysville, West Virginia, for genetic engineering research on fruit crops so as to improve fruit quality and improve resistance to diseases, insects, and other pests. The Appalachian Fruit Research Station is providing national leadership on this new genetic engineering approach to fruit improvement and cooperative research is planned with scientists in other fruit production regions.

46. Pear Thrip, Vermont. Provide $50,000 increase for research on various non-chemical means of controlling pear thrip, including fungi and other biological means.

    The funds will be made available to the University of Vermont to undertake a biological control research program on pear thrip in cooperation with ARS at Ithaca, New York.

47. Pesticide Application Research. Continue multidiscipline research now underway at Pesticide Research Unit, Stoneville, Mississippi.

    ARS is continuing the multidiscipline research at Stoneville on the development of improved application technology for chemical and biological control agents that is both cost-effective and significantly reduces drift and environmental contamination. Cooperatiave research between engineers, entomologists, and weed scientists has resulted in the development of a new air-assist sprayers to apply either chemicals or biological control agents at low volume. Improved weed and insect control has resulted from using the air-assist sprayer when compared to conventional methods.

48. Plant and Moisture Stress Laboratory, Texas. Continue research at the Plant and Moisture Stress Laboratory.

    The cooperative research program in plant stress and water conservation between ARS and the Texas Tech University are being continued.

49. Plant Genome Activities. Provide $100,000 increase to develop an ARS plan on plant genome activities.

    The ARS is using the $100,000 to establish a comprehensive plan for the USDA Plant Genome Mapping Program. The objective of the genome program will be to determine the localization, sequencing, and transferring of desirable genes in crop plants and forest species. The program will be directed and managed by ARS, but in cooperation with universities, industry, and other federal agencies including NIH, DOE, and NSF.

50. Poisonous Plants Research Laboratory, Logan, Utah. Provide $123,000 increase for the Northern Plains Area, Poisonous Plant Research Laboratory at Logan to conduct additional research on larkspur poisoning, broom snakeweed and Astragalus poisoning of wildlife and range animals.

The Congressional increase will be used to conduct additional research on larkspur poisoning, broom snakeweed and Astragalus poisoning of wildlife and range animals at the Poisonous Plants Research Laboratory.

51. Potato Research. Provide $500,000 increase for potato research in the areas of (1) Aphids ($200,000), and (2) Potato Beetles ($300,000). Also, maintain the tri-State potato breeding program at the FY 1989 level.

The ARS ongoing potato research program will continue in FY 1990 and will include a $500,000 increase for research on aphids and beetles. The research on potatoes continues to be cooperative with State agricultural experiment stations and is strongly supported by the U.S. potato industry. ARS will continue funding the cooperative tri-State potato breeding program at the FY-89 level.

52. Rangeland Grasses. Continue research on rangeland grasses and related problems. Also, allocate adequate levels of funding to the Ft. Keogh Livestock and Range Research Laboratory, Miles City, Montana.

The ARS concurs with Congress that identification of ways to combat the effect of drought on range grasses and other related problems should receive high priority. ARS is continuing the maintain adequate funding resources at the Ft. Keogh Laboratory.

53. Russian Wheat Aphid. Provide $750,000 increase as part of an integrated pest management program in coordination with APHIS, CSRS, and ES which has been developed by the National Russian Wheat Aphid Technical Advisory Group.

A National Russian Wheat Aphid Steering committee has been formed under the auspices of the National Association of Departments of Agriculture. This committee is chaired by the director of Idaho SAES and has representatives from APHIS, ARS, CSRS, SAES, ES, Industry, and the National Wheat Growers Association. As directed by Congress, ARS has developed a Russian Wheat Aphid action plan based on recommendations from this steering committee, as follows:

-to expand effort on biocontrol agents and to develop an integrated control program for Russian Wheat Aphid ($400,000, after sequester, Stillwater, Oklahoma);

-to exploit aphid pathogens discovered in Europe and the USSR on Russian Wheat Aphid. Laboratory research will be based at Ithaca, New York, and field research will be conducted in coordination with Stillwater, Oklahoma ($165,000, after sequester, Ithaca, New York);

-to provide resources in support of SAES, CSRS, and other to conduct foreign exploration for natural enemies of Russian Wheat Aphid.

-to provide accelerated funding to insure rapid utilization of biological control agents, cultural control measures, and resistant wheat and barley germplasm ($100,000, after sequester, Headquarters).

54. Scrapie Research. Provide $500,000 increase for scrapie research to develop diagnostic procedures for detecting animals infected with scrapie.

The increase will be used to develop a preclinical diagnostic test for sheep scrapie that detects the problem in the early stages of infection and is practical for field application. Sheep and cattle will be used to determine the susceptibility of U.S. cattle to U.S. sheep scrapie isolates and the pathogenesis of scrapie in sheep and cattle.

55. Small Farms Research Center, Booneville, Arkansas. Provide $200,000 increase for the Small Farms Research Center at Booneville, Arkansas.

Two new positions are being advertised as a result of the $200,000 increase. A legume agronomist and a support animal scientist will work with the existing staff to develop profitable forage and livestock production systems for hill-land small farms. Their work will focus on ways to extend the quality of forage in grazing systems and improve animal performance during normally low-quality phases of the grazing seasons by modified use of forage.

56. Appalachian Soil and Water Conservation Laboratory, Beckley, West Virginia. Provide $150,000 increase for support of research on land resource conservation and improved forage-livestock systems.

The increase will be used to support research on improved forage-livestock production systems consistent with conservation applicable to the Appalachian region land resources. The research will focus on increasing year-round lamb production of improved quality and composition.

57. Wheat Quality Laboratories. Provide $150,000 each to the four regional wheat quality laboratories: Soft Wheat Laboratory, Wooster, Ohio; Hard Winter Wheat Quality Laboratory, Manhattan, Kansas; Western Wheat Quality Laboratory, Pullman, Washington; and Hard Red Spring and Durum Wheat Quality Laboratory, Fargo, North Dakota.

The increase of $150,000 each to the four Wheat Quality Laboratories at Wooster, Manhattan, Pullman, and Fargo will help these laboratories to effectively and efficiently respond to the ever increasing numbers of samples from public wheat breeding programs and provide end-use variety evaluation to the breeders in a timely manner.

58. Aquaculture, Lane, Oklahoma. Provide $150,000 increase for the South Central Research Center for Aquaculture Research and Development.

The funds will be used to conduct research to improve the quality of catfish. The research will focus on reducing off-flavors in processed catfish and increasing the shelf-life of frozen fillets.

59. Fruit and Tree Nut Research Laboratory, Byron, Georgia. Provide $125,000 increase for research on the development of new rootstock for peaches, and to develop new varieties and alternate controls for disease, insect, and nematode pests.

ARS plans to use this increase for the expansion of existing research on peaches and peach rootstocks. Specifically, the increase will be used for the development of new and improved scion and rootstock varieties and for new and improved methods of disease, insect, and nematode pests.

60. Soybean Oil-based Ink. Provide $120,000 for research on soybean oil-based ink. Within this amount $50,000 is for development of a heat-set soybean ink at the national Printing Ink Research Institute at Lehigh University in Bethlehem, Pennsylvania.

Soybean oil can be used as a carrier oil for printing ink, instead of petroleum derived base oil used at present. To do so, the soybean product must be suitably treated and formulated Information is needed on physical and chemical characteristics of this vegetable oil. A variety of important properties is being tested at the USDA-ARS, Northern Regional Research Center and in collaboration with Lehigh University. This information will permit appropriate formulation of printers' inks.

61. Space Remote Sensing Center. Continue program jointly conducted by ARS and the Space Remote Sensing Center (SRSC).

The ARS will continue research cooperatively undertaken with the Institute for Technology Development on the application of satellite data.

62. Special Fund-ARS Junior Scientific Help. Continue to recruit Junior Scientific Help through the Special Fund appropriation to ARS.

ARS plans to continue to use the Special Funds as a source of recruiting and developing junior scientific help.

63. Sugarbeet Research. Provide $300,000 increase for sugarbeet research at the Northern Crop Science Laboratory.

The ARS will initiate work to develop a method of biological control of the sugarbeet root maggot, a major pest problem of the sugarbeet industry of North Dakota and other sugarbeet producing States. The approach is to use genetic engineering techniques to introduce specific toxins into non-pathogenic bacteria that naturally invade the sugarbeet root. The specific toxins then give protection against the root maggot.

64. Sugarcane Research, Hawaii. Provide $218,000 increase for research on the needs of the sugarcane industry in Hawaii, carried out through a contact with the Hawaiian Sugar Planters Association.

The ARS will strengthen support for the Hawaiian Sugar Planters Association on sugarcane research to use high fiber sugarcane hybrids, sugarcane relatives, and other annual fiber crops as renewable resources for paper fiber and other new products.

65. Sweetpotato Whitefly. Provide $100,000 increase for research on the sweetpotato whitefly.

The additional $100,00 was added to the ARS Orlando, Florida, laboratory to address the problem of early ripening in tomatoes and strengthen the biological control effort.

66. Systematic Entomology Laboratory. Provide $500,00 increase to upgrade the research program at the Systematic Entomology Laboratory at Beltsville.

A new scientist with expertise on agriculturally important moths was employed.

67. Table Grapes. Provide $75,000 increase for joint project with ARS, the University of California, and to California State University at Reno to study the use and residue of commercial sulphur dioxide on table grapes.

A cooperative project between ARS and the California Table Grape Commission has been initiated to develop alternatives to SO_2 treatment, and alter treatment schedule to reduce residue. The California Table Grape Commission will use the funds to support research at the University of California and the California State University at Fresno.

68. U.S. Sheep Experiment Station, Dubois, Idaho. Provide $200,00 increase for the purpose of new equipment and upgrading of facilities at the U.S. Sheep Experiment Station at Dubois, Idaho.

Funds will be used to partially complete facilities and purchase equipment to support Range Nutrition Research.

69. Urban Pest Research. Provide $150,000 increase for the Insects Affecting Man Laboratory at Gainesville, Florida, to strengthen the urban pest research program. Also expand research at the USDA termite research laboratory at Gulfport, Mississippi, and competitive research grants designated specifically for urban pest control.

The increase has been allocated to Gainesville, Florida, to (a) develop biotechnological means for the rapid and accurate detection of pesticide resistance in German cockroach populations; and (b) devise strategies for preventing the buildup of resistance to new pesticides and for managing those cockroach populations that are already resistant.

Research on termites and other wood-destroying pests is conducted at the U.S. Forest Service laboratory in Gulfport, Mississippi.

70. Vegetable Oils as Fuel. Continue research being conducted at Moscow, Idaho, on the use of vegetable oils as a replacement for diesel fuel at current level.

Research on the potential of vegetable oil as an alternate source of liquid fuel for agriculture is being continued at the current funding level.

71. Water Quality Research. Provide $8 million increase for research on water quality concerns.

The increase will be used to support a major groundwater quality initiative in the Midwest and to finance the third years of an aquaculture/plant culture project at the Spring and Groundwater Resources Institute. The increase allocated to the Midwest Initiative will be used to: support the use of intensively instrumented sites to evaluate the effectiveness of different corn and soybean production system, field test innovative ways to limit the leaching of herbicides and insecticides, improve our understanding of the effects of freeze-thaw cycles and soil macroporosity on water and chemical movement, and provide farmers and others with better procedures for selecting practices and farming systems that reduce substantially the risk of groundwater contamination.

The increase allocated to the Spring and Groundwater Resources Institute will be directed toward the efficient use in horticultural production of the nutrients contained in water used to grow fish. Emphasis will be placed on using the effluents from the aquaculture operation to grow small fruits hydroponically, and tree fruits using drip irrigation. The research will be conducted at the Institute using professionals from the Appalachian Fruit Research Laboratory.

72. Wheat Research. Continue cooperative research with the Eastern Soft Wheat Quality Laboratory in connection with the milling, flour, dough and baking tests at Michigan State University.

The appropriation of $19,000 will continue to be used to support cooperative research between Michigan State University and the Eastern Soft Wheat Quality Laboratory.

73. National Animal Disease Center (NADC), Ames, Iowa. Expects ARS to make full utilization of the NADC. ARS should submit a report to the Committee on its current assessment of the effectiveness and safety of the necropsy incinerator at this Center.

The NADC at Ames is being fully utilized by ARS to perform many of its research responsibilities to our nation's animal industry. Also, ARS is in the process of completing the assessment of the effectiveness and safety of the necropsy incinerator at the Center. A report is currently being prepared for the Committee in response to this directive

AGRICULTURAL RESEARCH SERVICE

Purpose Statement

The Agricultural Research Service was established on November 2, 1953, pursuant to authority vested in the Secretary of Agriculture by 5 U.S.C. 301 and Reorganization Plan No. 2 of 1953, and other authorities.

The research performed by the Agricultural Research Service (ARS) is authorized by the Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201, 2204), the Research and Marketing Act of 1946, as amended (7 U.S.C. 427,1621), the Food and Agriculture Act of 1977, as amended (7 U.S.C. 1281 note), and the Food Security Act of 1985 (7 U.S.C. 3101 note).

The Agricultural Research Service is responsible for conducting mission-oriented research on:

--Soil and Water Conservation
--Plant Sciences
--Animal Sciences
--Commodity Conversion and Delivery
--Human Nutrition
--Integration of Agricultural Systems

The research applies to a wide range of goals; commodities; natural resources; fields of science; and geographic, climatic and environmental conditions.

As the U.S. Department of Agriculture's in-house agricultural research agency, ARS has major responsibilities for conducting and leading the national agricultural research effort. ARS provides initiative and leadership in five areas:

* Research on broad regional and national problems.
* Research to support Federal action and regulatory agencies.
* Expertise to meet national emergencies.
* Research support for international programs.
* Scientific resource to the Executive Branch and Congress.

The mission of ARS research is to develop new knowledge and technology which will insure an abundance of high quality agricultural commodities and products at reasonable prices to meet the increasing needs of an expanding economy and to provide for the continued improvement in the standard of living of all Americans. This mission focuses on the development of technical information and technical products which bear directly on the needs to (1) manage and use the Nation's soil, water, air, and climatic resources, and improve the Nation's environment; (2) provide an adequate supply of agricultural products by practices that will maintain a permanent and effective agriculture; (3) improve the nutrition and well-being of the American people; (4) improve living in rural America; and (5) strengthen the Nation's balance of payments.

Research is conducted at numerous field locations in the States, District of Columbia, Puerto Rico, the Virgin Islands, and in several foreign countries. Much of the work is conducted in direct cooperation with the State agricultural experiment stations, other State and Federal agencies, and private organizations.

Central offices of ARS are in the Washington, D.C. Metropolitan Area. The field activities are managed on a national basis through 8 Area Offices. Activities are carried out at 126 separate field locations. As of September 30, 1989, there were 6,947 full-time employees and 1,624 other than full-time employees. Of the total, 453 full-time employees and 30 other than full-time employees worked in the headquarters office.

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff-Years

1989 Actual and Estimated, 1990 and 1991

Item	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Direct Appropriation:						
Agricultural Research Service	$563,381,000	7,988	$585,923,000	7,988	$623,510,000	7,988
Buildings and Facilities	17,044,211	--	10,675,000	--	32,600,000	--
Total, Direct Appropriation	580,425,211	7,988	596,598,000	7,988	656,110,000	7,988
Deduct Allotments to Other Agencies:						
Forest Service	-356,435	--	-360,275	--	-362,000	--
Net	580,068,776	7,988	596,237,725	7,988	655,748,000	7,988
Obligations from other USDA Appropriations:						
Agricultural Marketing Service	94,659	1	100,000	1	100,000	1
Animal and Plant Health Inspection Service	7,021,653	105	7,100,000	105	7,100,000	105
Federal Grain Inspection Service	180,425	2	200,000	2	200,000	2
National Agricultural Library	511,755	2	500,000	2	500,000	2
Forest Service	169,116	1	150,000	1	150,000	1
Food Safety and Inspection Service	1,501,207	4	1,500,000	4	1,500,000	4
Human Nutrition Information Service	106,959	1	100,000	1	100,000	1
Office of International Cooperation and Development	688,432	5	700,000	5	700,000	5
Soil Conservation Service	394,386	5	400,000	5	400,000	5
Cooperative State Research Service	74,338	1	100,000	1	100,000	1
Miscellaneous Reimbursements	58,105	1	50,000	1	50,000	1
Total, Other USDA Funds	10,801,035	128	10,900,000	128	10,900,000	128
Total, Agriculture Appropriations	590,869,811	8,116	607,137,725	8,116	666,648,000	8,116

Available Funds and Staff-Years

1989 Actual and Estimated, 1990 and 1991

Item	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Other Federal Funds:						
Department of Defense	852,222	4	850,000	4	850,000	4
Department of Energy.	837,221	4	850,000	4	850,000	4
Department of Health and Human Services..	1,745,128	6	1,750,000	6	1,750,000	6
Department of Interior............	314,782	2	300,000	2	300,000	2
Department of State................	463,023	1	450,000	1	450,000	1
Environmental Protection Agency...	842,143	3	800,000	3	800,000	3
Miscellaneous Reimbursement.......	605,304	2	500,000	2	500,000	2
Total, Other Federal Funds	5,659,823	22	5,500,000	22	5,500,000	22
Non-Federal Funds:						
State of California..	170,791	2	200,000	2	200,000	2
Binational Agriculture Research & Development Agreement (BARD) ..	674,142	8	700,000	8	700,000	8
Quarters and Subsistence	131,669	1	200,000	1	200,000	1
Miscellaneous Reimbursement	2,948,540	7	2,503,000	7	2,500,000	7
Total, Non-Federal Funds	3,925,142	18	3,603,000	18	3,600,000	18
Miscellaneous Contributed Funds..	6,009,423	44	5,000,000	44	5,000,000	44
Total, Agricultural Research Service......	606,464,199	8,200	621,240,725	8,200	680,748,000	8,200

Full-Time Equivalent Staff-Years:	1989 Actual	1990 Estimated	1991 Estimated
Ceiling............	8,200	8,200	8,200
Non-Ceiling........	150	150	150
Total............	8,350	8,350	8,350

Permanent Positions by Grade and Staff-Year Summary

1989 Actual and Estimated 1990 and 1991

Grade	1989 Actual			1990 Estimate			1991 Estimate		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
ES-5	5	6	11	5	6	11	5	6	11
ES-4	1	13	14	1	13	14	1	13	14
ES-3	1	5	6	1	5	6	1	5	6
ES-2	--	2	2	--	2	2	--	2	2
GS-16	3	--	3	3	--	3	3	--	3
GS/GM-15	43	319	362	43	319	362	43	319	362
GS/GM-14	27	519	546	27	519	546	27	519	546
GS/GM-13	96	707	803	96	707	803	96	707	803
GS-12	76	663	739	76	663	739	76	663	739
GS-11	21	429	450	21	429	450	21	429	450
GS-10	1	16	17	1	16	17	1	16	17
GS-9	19	712	731	19	712	731	19	712	731
GS-8	3	275	278	3	275	278	3	275	278
GS-7	38	642	680	38	642	680	38	642	680
GS-6	69	500	569	69	500	569	69	500	569
GS-5	57	580	637	57	580	637	57	580	637
GS-4	30	347	377	30	347	377	30	347	377
GS-3	4	42	46	4	42	46	4	42	46
GS-2	--	7	7	--	7	7	--	7	7
GS-1	--	5	5	--	5	5	--	5	5

Permanent Positions by Grade and Staff-Year Summary

1989 Actual and Estimated 1990 and 1991

Grade	1989 Actual			1990 Estimate			1991 Estimate		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
Positions at rates Established by Act June 20, 1958 (U.S.C. 3104)	--	20	20	--	20	20	--	20	20
Grades Established under Foreign National Pay Plan..	--	28	28	--	28	28	--	28	28
Ungraded Positions.	--	630	630	--	630	630	--	630	630
Total Permanent Positions	494	6,467	6,961	494	6,467	6,961	494	6,467	6,961
Staff-Years:									
Ceiling	489	7,711	8,200	489	7,711	8,200	489	7,711	8,200
Non-Ceiling	10	140	150	10	140	150	10	140	150
TOTAL	499	7,851	8,350	499	7,851	8,350	499	7,851	8,350

AGRICULTURAL RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1989 Actual and Estimated 1990 and 1991

	1989 Actual	1990 Estimated	1991 Estimated
Personnel Compensation:			
Headquarters	$18,343,208	$19,109,000	$19,931,000
Field	240,011,843	250,032,000	260,784,000
11 Total Personnel Compensation	258,355,051	269,141,000	280,715,000
12 Personnel Benefits	47,261,143	49,064,000	50,837,000
13 Benefits for former employee	299,171	- -	- -
Total Pers. Comp. & Benefits	305,915,365	318,205,000	331,552,000
Other Objects:			
21 Travel and transportation of persons	9,511,896	9,961,000	10,411,000
22 Transportation of things	1,371,714	1,400,000	1,450,000
23 Communications, utilities and miscellaneous charges	30,184,965	31,600,000	33,100,000
24 Printing and reproduction	833,039	850,000	875,000
25 Other services	123,766,152	123,447,000	139,607,000
26 Supplies and materials	44,179,665	47,612,000	49,992,000
31 Equipment	36,272,679	39,523,000	42,323,000
32 Lands and Structures	10,774,466	19,050,000	34,200,000
41 Grants, subsidies, and contributions	9,870,190	13,000,000	10,000,000
Total Other Objects	266,764,766	286,443,000	321,958,000
Total Obligations	572,680,131	604,648,000	653,510,000

Position Data:

	1989 Actual	1990 Estimated	1991 Estimated
Average Salary, ES positions	$74,163	$78,957	$94,987
Average Salary, GM/GS positions	31,303	32,617	33,698
Average Grade, GM/GS positions	9.98	9.98	9.98
Average Salary of Ungraded positions	$31,584	$32,765	$33,736

Note: Includes Salaries and Expenses and Buildings and Facilities Appropriations.

AGRICULTURAL RESEARCH SERVICE
(INCLUDING TRANSFERS OF FUNDS)

The estimates include proposed changes in the language of this item as follows (new language underscored; deleted matter enclosed in brackets):

Agricultural Research Service:

For necessary expenses to enable the Agricultural Research Service to
perform agricultural research and demonstration relating to production,
utilization, marketing, and distribution (not otherwise provided for),
home economics or nutrition and consumer use, and for acquisition of
lands by donation, exchange, or purchase at a nominal cost not to exceed
$100, [$592,339,000] $621,510,000: Provided, That appropriations
hereunder shall be available for temporary employment pursuant to the
second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C.
2225), and not to exceed $115,000 shall be available for employment under
5 U.S.C. 3109: Provided further, That funds appropriated herein can be
used to provide financial assistance to the organizers of national and
international conferences, if such conferences are in support of agency
programs: Provided further, That appropriations hereunder shall be
available for the operation and maintenance of aircraft and the purchase
of not to exceed one for replacement only: Provided further, That uniform
allowances for each uniformed employee of the Agricultural Research
Service shall not be in excess of $400 annually: Provided further, That
appropriations hereunder shall be available to conduct marketing research:
Provided further, That appropriations hereunder shall be available
pursuant to 7 U.S.C. 2250 for the construction, alteration, and repair of
buildings and improvements, but unless otherwise provided the cost of
constructing any one building shall not exceed $250,000, except for
1 headhouses or greenhouses which shall each be limited to [$750,000]
$1,000,000, and except for ten buildings to be constructed or improved at
a cost not to exceed [$450,000] $500,000 each, and the cost of altering
any one building during the fiscal year shall not exceed 10 per centum of
the current replacement value of the building or $250,000, whichever is
greater: Provided further, That the limitations on alterations contained
in this Act shall not apply to modernization or replacement of existing
facilities at Beltsville, Maryland: Provided further, That the foregoing
limitations shall not apply to replacement of buildings needed to carry
2 out the Act of April 24, 1948 (21 U.S.C. 113a): [Provided further, That
the foregoing limitations on purchase of land shall not apply to the
purchase of land at Corvallis, Oregon; Weslaco, Texas; and Kimberly,
Idaho:] Provided further, That not to exceed $190,000 of this
appropriation may be transferred to and merged with the appropriation for
the Office of the Assistant Secretary for Science and Education for the
scientific review of international issues involving agricultural chemicals
and food additives.

Special Fund: To provide for additional labor, subprofessional, and junior scientific help to be employed under contracts and cooperative agreements to strengthen the work at Federal research installations in the field, $2,000,000.

Agricultural Research Service (continued)

The first change would increase the cost limitation on construction of ten buildings from $450,000 to $500,000 each. It would also change the limitation on headhouses connecting greenhouses to provide a $1,000,000 limit on each headhouse or greenhouse.

The construction cost limitation on buildings should be increased in FY 1991 to maintain the previous values of these authorizations. Increases requested are derived from conservative estimates of cost changes for construction of specialized research laboratories and associated support facilities applicable in the construction industry.

The ARS and the Office of General Counsel (OGC) have long recognized that the dollar limitations are relatively low in terms of the ability to accomplish alterations and construction of research laboratory space. Such work routinely includes site utilities, special heating, ventilation, and temperature/humidity control requirements as well as special equipment like fume hoods and other research equipment. These features are essential in the accomplishment of sophisticated high technology research. These special features significantly increase the cost of construction and the cost of such special features have routinely been exempted from the limitations.

The ARS facility needs must often be subjectively broken into chargeable and non-chargeable cost items as they cannot be satisfied within the existing monetary limitations. This subjective determination of exempted costs is of great concern to the OGC.

To alleviate the OGC concern, to provide for uniformity and consistency, and to provide for the increased costs due to special construction requirements, the appropriation limitation should be adjusted upward to cover all incurred costs to provide the type and size of research facility needed.

The second change would delete language for the purchase of land at Corvallis, Oregon; Weslaco, Texas; and Kimberly, Idaho. This language will not be required in FY 1991.

AGRICULTURAL RESEARCH SERVICE

Appropriation Act, 1990	$594,339,000
Budget Estimate, 1991	623,510,000
Increase in Appropriation	+29,171,000

Adjustments in 1990		
Appropriation Act, 1990	$594,339,000	
Gramm-Rudman-Hollings Reduction (P.L. 99-177)	-8,193,000	
Transfer to Animal and Plant Health Inspection Service	-223,000[a]	
Adjusted Base for 1990		585,923,000
Budget Estimate, 1991		623,510,000
Increase over adjusted 1990		+37,587,000

[a] Transfer in the Estimates for joint use of Plum Island, New York, facilities per Memorandum of Understanding dated July 26, 1989.

SUMMARY OF INCREASES AND DECREASES
(On basis of specific projects)

	1990 Estimated	Pay Cost	Program Changes	1991 Estimated
1. Research to reduce ground-water contamination and enhance water quality	$37,477,000	- -	+$7,400,000	$44,877,000
2. Research to determine impact of global climate change on the agricultural environment and agricultural impacts on climate	1,064,000	- -	+$7,415,000	$8,479,000
3. Plant germplasm acquisition, maintenance and enhancement.	28,104,000	- -	+2,200,000	30,304,000
4. Plant genome research	99,000	- -	+3,674,000	3,773,000
5. Research to control narcotic plants	1,484,000	- -	+5,000,000	6,484,000
6. Research to enhance animal health	8,832,000	- -	+1,500,000	10,332,000
7. Animal germplasm preservation and evaluation	5,001,000	- -	+1,700,000	6,701,000
8. Research to assure food quality and safety for the nation's consumers	27,517,000	- -	+10,800,000	38,317,000
9. Repair and maintenance of Federal facilities	24,914,000	- -	-7,550,000	17,364,000
10. All other	451,431,000	+$5,448,000	- -	456,879,000
Total Available	585,923,000	+5,448,000	+32,139,000	623,510,000

SUMMARY OF INCREASES AND DECREASES
(On basis of program activity)

Projects	1990 Estimated	Pay Cost	Program Changes	1991 Estimated
1. Research on soil and water conservation......	$73,565,000	+$663,000	+$14,815,000	$89,043,000
2. Research on plant sciences................	216,589,000	+2,289,000	+10,874,000	229,752,000
3. Research on animal sciences................	99,833,000	+1,087,000	+3,200,000	104,120,000
4. Research on commodity conversion and delivery.	110,113,000	+1,135,000	+10,800,000	122,048,000
5. Human nutrition research................	47,873,000	+154,000	- -	48,027,000
6. Integration of agricultural systems........	12,108,000	+120,000	- -	12,228,000
7. Repair and maintenance of facilities...........	24,914,000	- -	-7,550,000	17,364,000
8. Contingencies...........	928,000	- -	- -	928,000
Total Available.......	585,923,000	+5,448,000	+32,139,000	623,510,000

Project Statement
(on the basis of adjusted appropriation)

PROJECT	1989 Actual		1990 Estimated		Increase or Decrease	1991 Estimated	
	AMOUNT	Staff Years	AMOUNT	Staff Years		AMOUNT	Staff Years
1. Research on soil and water conservation....	$65,980,717	971	$73,565,000	971	+$15,478,000(1)	$89,043,000	971
2. Research on plant sciences......	213,967,351	3,356	216,589,000	3,356	+13,163,000(2)	229,752,000	3,356
3. Research on animal sciences......	94,342,950	1,594	99,833,000	1,594	+4,287,000(3)	104,120,000	1,594
4. Research on commodity conversion and delivery.	107,811,907	1,665	110,113,000	1,665	+11,935,000(4)	122,048,000	1,665
5. Human nutrition research........	45,576,211	226	47,873,000	226	+154,000(5)	48,027,000	226
6. Integration of agricultural systems.......	12,978,887	176	12,108,000	176	+120,000(6)	12,228,000	176
7. Repair and maintenance of facilities..........	20,843,742	- -	24,914,000	- -	-7,550,000(7)	17,364,000	- -
8. Contingencies	a/	- -	928,000	- -	- -	928,000	- -
Unobligated balance......	1,879,235	- -	- -	- -	- -	- -	- -
Total, available or estimate...	563,381,000	7,988	585,923,000	7,988	+37,587,000	623,510,000	7,988
Transfer to APHIS..........	- -	- -	223,000	- -			
Pro-rata reduction P.L. 99-177...	- -	- -	8,193,000	- -			
Total, Appropriation......	563,381,000	7,988	594,339,000	7,988			

a/ Obligations incurred under the Research Contingency Fund in 1989 amount to $941,500 and are reflected in the Program Activities listed above.

AGRICULTURAL RESEARCH SERVICE

Explanation of Program

Under the Agriculture, Rural Development and Related Agencies Appropriations, the Agricultural Research Service develops the means for:

1. Managing and conserving the Nation's soil and water resources for a stable and productive agriculture. -- Research is conducted to develop the technology for assessing and predicting long-term changes in the quantity and quality of soil, water, and air resources available to agriculture; to provide the technology needed for improving, protecting, and restoring the productive capacity of agricultural soils; to develop improved water-management systems and practices to achieve effective and efficient use of water resources; and to develop subsystems and models that integrate the use of soil, water, and air resources for optimum management of major land resource areas.

2. Maintaining and increasing the productivity and quality of crop plants. -- Research is conducted to broaden the germplasm resources of plants and beneficial organisms to ensure maximum genetic diversity for improved productivity; to select and modify germplasm of plants, beneficial organisms, and pests; to develop improved production practices for maintaining and increasing crop productivity and quality and for reducing costs; to discover principles and develop improved methods for reducing crop losses caused by weeds, diseases, insects, nematodes, and other pests; and to develop improved methods for integrating the crop- and pest-management practices needed for higher and more stable levels of crop production.

3. Increasing the productivity of animals and the quality of animal products. -- Research is conducted to increase the genetic capacity of animals for production; to improve the efficiency of reproduction and reproduction-related biological processes; to improve animal nutrition and feed efficiency to increase productivity and product quality; to develop ways to prevent or control losses from diseases, parasites, and toxicants and other substances that limit animal performance and reduce the quality of animal products; to develop means for controlling insects, ticks, and mites that affect animals and man; and to devise means for improving and integrating procedures and facilities for production and transport of animals to increase productivity, reduce costs, and minimize stresses.

4. Achieving maximum use of agricultural products for domestic markets and export. -- Research is conducted to develop means for enhancing the inherent properties and uses of agricultural materials; to develop the means for meeting foreign and domestic user and regulatory requirements relating toxic factors in food, feed, and other agricultural products; to develop means for reducing or eliminating postharvest losses caused by pests, spoilage, and physical and environmental damage; and to develop the means for increasing efficiency of systems for processing, handling, storing, and distributing agricultural products.

5. Promoting optimum human health and well-being through improved nutrition and family resource management. -- Research is conducted to define the nutrient requirements of humans at all stages of the life cycle; to determine the nutrient content of agricultural commodities and processed foods as eaten, and establish the bioavailability of their nutrients; and to improve the nutritional status of humans and the well-being of families by making techniques available for assessing the effectiveness of nutrition and home economics programs.

6. Integrating scientific knowledge of agricultural production, processing, and marketing into systems that optimize resource management and facilitate transfer of technology to users. -- Research is conducted to develop integrated systems for efficiently producing, processing, and marketing agricultural products; and to develop alternative agricultural systems, including those of small scale, that are less dependent upon nonrenewable resources and that are productive, efficient, and sustainable in the long term.

7. Repair and maintenance of facilities. -- Funds are used to repair and maintain ARS facilities to provide safe, energy-efficient and functional workspace for in-house research. In addition to this national program which focuses primarily on safety and energy retrofit projects, ARS is committed to adequately funding routine maintenance and repair. To assure that all facilities are properly maintained, each location allocates program funds as appropriate to perform the most pressing needs.

The research performed by Agricultural Research Service (ARS) is authorized by the Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201, 2204) the Research and Marketing Act of 1946, as amended (7 U.S.C. 427, 1621) the Food and Agriculture Act of 1977, as amended (7 U.S.C. 1281 note), and the Food Security Act of 1985 (7 U.S.C. 3101 note).

JUSTIFICATION OF INCREASES AND DECREASES

(1) An increase of $15,478,000 for research on soil and water conservation consisting of:

(a) An increase of $7,400,000 for research to reduce groundwater contamination and enhance water quality ($37,477,000 available in FY 1990).

Need for Change: The general public is concerned that the quality of the Nation's drinking water is being degraded by pesticides, nutrients, sediments, animal wastes, salts, and toxic trace elements. The Water Quality Act of 1987 has underscored the need for improved control of nonpoint sources of pollution associated with Agriculture. In FY 1990, a Presidential Initiative on Enhancing Water Quality was announced to promote a national priority and visibility for this issue throughout the next four years. The information required to accurately assess groundwater quality and focus resources to accomplish needed changes is identified in the USDA Research Plan for Water Quality Research.

Nature of Change: A multi-faceted national approach to developing technologies that minimize the impact of agricultural chemicals will be supported by this increase. The integrated nationally directed water quality program will be used to achieve the goals and objectives of the USDA Research Plan for Water Quality. Chemical transport research will stress the development of new and improved farming strategies and decision aids. Priority will be given to solving the problems of sampling, sample integrity, and analytical methodology. Further research will be undertaken to more completely define the chemical and biological degradation process, mobility and leaching processes, and volatilization and plant uptake processes for the agricultural chemicals being detected in groundwater. New weed control practices will be developed that include the use of herbicides in controlled-release carriers; low-persistence herbicides; band applications of herbicides; specific application times and rates; split applications; herbicide combinations; and combination of chemical and nonchemical measures. Standardized methods for quantifying differences among pesticides in leachability, and differences among soil variables and management practices in their effects on pesticide leachability will be developed. These research projects will provide for the knowledge needed by the Extension Service and the Soil Conservation Service in formulating educational and technical assistance programs to their clientele.

Plant breeding and germplasm research will address the utilization of nitrogen fertilizer more efficiently by major crops, thereby minimizing the potential for nitrate pollution. Research will be supported that promotes the development of resistance to those insects, nematodes, and diseases that require the use of pesticides that pose a significant threat to water quality. Molecular biology research that specifies the nature and composition of these chemicals and determines the regulatory molecular gene systems controlling their expression, will be expanded. Attention will also be given to the genetic engineering of microbes that will provide pest resistance with reduced environmental damage.

New and more diversified crop production systems that substantially decrease the movement of potentially hazardous chemicals to groundwater will be developed. Simplified forms of water quality models will be developed for national and community managers and regulatory personnel to predict in broad terms environmental fate of chemicals introduced into agricultural systems. New fertilizer practices will be developed and tested that include the use of various regulators of soil and crop biology to control soil nitrate levels during periods of high leaching potential, management practices that synchronize soil nitrate availability with nitrogen requirement of the crop, and the use of winter cover crops to reduce water and nitrate levels in the soil during noncrop seasons. Developments in pesticide application technology will also be evaluated for effectiveness with these new crop production systems.

The need for ARS to strengthen collaborative work with other agencies and institutions with national research capabilities and responsibilities related to water quality protection will be emphasized particularly as it relates to cooperation with CSRS and the State Experiment Stations. A continued expansion of collaborative research with the U.S. Geological Survey and EPA is projected. The transfer of scientific information on groundwater quality research to action agencies will be given a high priority.

(b) An increase of $7,415,000 for research to determine impact of global climate change on the agricultural environment and agricultural impacts on climate ($1,064,000 available in FY 1990).

Need for Change: Human activities including production and combustion of fossil fuels, clearing of forest lands, increases in ruminant animal and wet rice production, increased use of nitrogen fertilizers, and manufacture and release of chlorofluorocarbons are changing the composition of the earth's atmosphere. Earth systems models indicate that these changes could substantially alter the global environment. Predicted environmental changes include increased atmospheric carbon dioxide concentration, elevated ultraviolet radiation levels, higher temperatures, and less predictable rainfall. This nationally coordinated research assesses the impact of these changes on agricultural production, and the impact of agricultural production on factors that control these changes. This research project, which will be coordinated with the research being performed by other agencies, will enable the Cooperative Extension Service to carry out educational programs to farmers and ranchers in this emerging international concern.

Nature of Change: The multi-faceted research approach will focus on understanding the physical, chemical, and biological processes linking the performance of the agricultural system to climate change variables. This understanding will be captured and quantified in system models, which will serve not only as a framework to organize experimental data and response functions, but also as the foundation for the development of decision-aids for agricultural and natural resource managers. These decision-aids will help managers developing alternative production systems that are resilient to possible future global change stresses. They will also provide a basis for developing agricultural management practices that minimize their negative impacts on climate change. These include reducing the evolution of trace gases such as carbon dioxide, methane, nitrous oxide, tropospheric aerosols such as dust and smoke, and optimizing vegetative land cover and soil properties that influence water absorption and storage capacity, sediment yield or other hydrologic properties, as well as surface albedo which affects radiation absorption.

Specifically ARS will conduct controlled experiments to determine the biological responses of important agricultural crops and animals to climate variables. The information gained from these experiments will be used to develop physiologically-based computer models to predict the effects of global change on the performance of agricultural crops and animals, and the impact of management practices on factors that affect climate change. From these predictions, economic impact and risk assessment models will be developed to help policy makers establish management strategies for agricultural systems to cope with global climate change on a national scale.

Because of the particular importance of carbon dioxide, research will be performed to determine the impact of its rising concentration on plants. Emphasis will be on crop, rangeland, and tree performance under changing levels of carbon dioxide, temperature, soil water, and UV-B radiation. Experimental results from this research will help fill knowledge gaps that now limit our capability to accurately predict yields and requirements for fertilizers, irrigation, and other inputs at expected future environments. These results will also improve estimates of the strength of the carbon sink represented by the biosphere at elevated carbon dioxide concentrations and elevated temperatures. This initiative will accelerate current research efforts that are being conducted in cooperation with the Department of Energy to obtain critical physiological response functions of major plant species to increasing carbon dioxide concentration. In addition, experimental facilities operated at controlled carbon dioxide concentrations will range from fully controlled growth chambers to open-top field enclosures to non-enclosed field releases.

This increase will also support experimental assessments of the evolution of methane from rice and ruminant animals and nitrous oxides from use of fertilizers. These results, as well as those from the carbon dioxide experiments, will be incorporated into simulation models. These models have the potential for encapsulating our knowledge in a form that can be used for making predictions. Crop and animal models will serve as building blocks for simulators that deal with more complex environments, including natural ecosystems. The Department of Energy has need for simulators to predict the biosphere response to future climatic conditions, including a high-carbon dioxide world. USDA requires simulators to predict the yield and performance of crops and animals that sustain our food and fiber system under future environmental conditions that may be very different from those of the past. Gaseous and aerosol fluxes from agricultural lands are needed as inputs to global circulation models.

Simulation models will be modular based on physiological mechanisms. They will account for environmental factors including carbon dioxide concentration, temperature, moisture, and radiation level and quality. Modules developed for one crop or animal species will serve as a foundation for extending predictions for other crops and for simulation of the response of species in natural ecosystems for the entire nation.

(c) An increase of $663,000 which represents 50 percent of the 1991 pay raise. The remaining 50 percent of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(2) An increase of $13,163,000 for research on plant sciences consisting of:

(a) An increase of $2,200,000 for plant germplasm acquisition, maintenance and enhancement ($28,104,000 available in FY 1990).

Need for Change: These funds will be used to support the nationally directed and Federal-State-industry coordinated National Plant Germplasm System. A wide array of genetic diversity is essential to reduce the genetic vulnerability of crop plants to climatic stress and pests, while lowering production costs and improving product quality. After acquisition by exploration or exchange, it is essential to accurately classify taxonomically; document in the Germplasm Resources Information Network (GRIN) database; and distribute the material to the repositories as rapidly as possible. Quarantine clearance procedures must be enacted and pathogen tests must be rapid and accurate. Germplasm evaluation and enhancement is critical if desired genetic diversity is to be identified and utilized in a sustained, productive agriculture.

Nature of Change: Selected genetic stock collections of crops will be assembled for systematic evaluation and use in genome mapping projects. The National Clonal Germplasm Repositories for fruit and nut crops will be expanded and improved technologies developed for maintaining and distributing accessions.

In the area of enhancement, special emphasis will be given to the screening and utilization of the germplasm collections to identify and incorporate new sources of disease, insect, and nematode resistance in our major field and horticultural crops. Materials also will be screened for pest resistance and tolerance to climatic stress including drought, heat, and cold. Special emphasis will be given to expediting the plant quarantine process to ensure the safety of the material introduced and accelerate its transfer to users. Winter nurseries will be strengthened to accelerate germplasm evaluation and enhancement of corn, sorghum, peanut, soybean, and other crops.

The international collection of nitrogen fixing Rhizobium bacteria will be supported to ensure that this valuable material will be preserved and made available to all research scientists for increasing the efficiency of biological nitrogen fixation in our cropping systems.

(b) An increase of $3,674,000 for plant genome research ($99,000 available in FY 1990).

Need for Change. A plant genome program is essential for the U.S. to maintain and strengthen a strong global position in agricultural efficiency and profitability. Knowledge about the genomes of important food and forest species is essential to control or influence yield, time of maturation, nutritional content, and resistance to disease, insects and drought, and to develop and improve crops. The products of plant genome research can have wide application and can have beneficial impact on the environment, on the production of food, fibers, fuel, and on human nutrition and health.

It is timely to accelerate a coordinated and directed plant genome research program. Other nations are aggressively pursuing plant genome mapping efforts at this time and threaten U.S. leadership in further developing the agricultural sciences. The ability of American agriculture to meet 21st Century challenges will depend on investments made now. The scientific tool of biotechnology can capitalize on recent advances in our understanding of biology, and offers promise of new markets and new solutions to problems not conceivable a few years ago.

Nature of Change. The proposed program will be national in scope with strong international implications and will require maximum input, cooperation, and planning across the entire scientific community. There will be networking and coordination with plant genome activities of the National Institutes of Health, National Science Foundation, Department of Energy, Forest Service, other Federal agencies, the agricultural industry, and the international arena.

Responsibility for gene mapping important agronomic crops will be assigned to the ARS. Specifically, ARS will be accountable to locate, transfer, and maintain plant genes that are desirable in agronomic crops in order to solve problems associated with drought, disease, and other factors that affect yield and quality of products. ARS is a problem-solving Agency concerned with national agricultural challenges and has a long-term commitment in this research area through its strong plant breeding program. The gene mapping program will be closely integrated with the ARS germplasm program and depends in large part on informational services provided by the National Agricultural Library. Additionally, ARS managers have an in-depth knowledge of the mission-oriented needs of USDA and other Federal agencies and will, therefore, help identify the most pressing areas toward which to target competitive grant program funds. The Cooperative State Research Service's budget proposes $15 million for this effort under its National Research Initiatives proposal. A peer review panel will evaluate and score all proposals.

The Plant Genome Mapping Program will be housed in the Agricultural Research Service and managed by a director with scientific input from a coordinating committee co-chaired by ARS and CSRS representatives.

In parallel with the expanded and more intensively coordinated plant gene mapping initiative, a major national information networking system will be developed and maintained to support the plant gene mapping generated knowledge base. A logical, phased approach to developing such a network and data base of information will be followed. The approach to this essential requirement will entail assembling a group of scientists presently involved in plant gene research, computer scientists/specialists, computer telecommunications and data informers to identify the requirements/needs of the total system and determine what should be done.

(c) An increase of $5,000,000 for research to control narcotic plants ($1,484,000 available in FY 1990).

Need for Change: Additional funding is required for research to expedite the development of an environmentally-safe control agent for the eradication of illicit narcotic crops.

Nature of Change: The recommended funding will be used to develop environmentally safer control technology including new control agents, production systems, formulations, and application technology. Research on the physiology and biochemistry of illicit narcotic crops will be expanded with the objective of discovering new potential targets for additional control technology.

(d) An increase of $2,289,000 which represents 50 percent of the 1991 pay raise. The remaining 50 percent of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(3) An increase of $4,287,000 for research on animal sciences consisting of:

(a) An increase of $1,500,000 for research on economically important diseases of livestock and poultry ($8,832,000 available in FY 1990).

Need for Change: Increased research funding on economically important diseases of livestock and poultry is required to enhance the speed, accuracy, and sensitivity of diagnostic tests. These include both domestic and foreign diseases that threaten our national livestock and poultry industries. Diagnostic tests are needed by APHIS and FSIS to assure that diagnosis, control, and eradication of the disease can be more effectively carried out to prevent losses and reduce costs to producers and to enhance U.S. exports of live animals and animal products. Research is also needed to develop diagnostic technology for foreign and domestic diseases in embryos which will reduce transmission of disease agents and increase export of animals and animal products.

Nature of Change: Research will be initiated to provide information on specific gene actions of hosts, pathogens, and vectors and those interactions that enhance detection of diseases, parasites, and arthropods affecting livestock and poultry. Genetic factors which control the immune response of the host will be investigated. Nonpathogenic living vectors capable of transporting and expressing selected foreign genes to confer enhanced immunity without producing clinical manifestations of disease in a host will be developed. Gene insertion directly into host genomes will also be investigated. Cellular immune components of the host that are genetically controlled will be identified so that efforts can be directed toward altering their external genetic expression.

Specific research will be conducted to: develop disabled (replication defective) retroviral vectors and the technology for using them to insert genes in the germline; use the vector system to insert genes for disease resistance into the germline of chickens and evaluate inheritance, expression, and disease resistance; clone or obtain clones of genes that can be used to enhance disease resistance using gene insertion technology; and construct avian virus vectors for the transmission and expression of desirable genes in poultry.

Research on economically important infectious diseases, noninfectious diseases, and internal and external parasites, such as avian influenza, hemoparasites, coccidiosis, cattle grubs, helminths, ticks, Johne's disease, spongiform encephalopathies, respiratory disease, collibacillosis, and atrophic rhinitis will be directed at enhancing the speed, accuracy, and sensitivity of diagnostic procedures. This research addresses national problems and requires central direction and coordination.

This technology will contribute to the support of action agency programs in animal disease control and eradication.

(b) An increase of $1,700,000 for economically important animal germplasm preservation and evaluation ($5,001,000 available in FY 1990).

Need for Change: Funding is essential to enhance animal germplasm for its diversity to ensure continued genetic improvement and to conduct research on economically important domestic and foreign diseases of livestock and poultry to prevent losses, assure diagnosis, control, and eradication.

Availability and effective utilization of animal genetic resources in food and fiber species are essential to ensure efficient production of animal products. The U.S. livestock industry is dependent on access to global stocks for its continuing development. Access to global stocks of animal germplasm is essential to improve the efficiency of animal production by utilizing new sources of genetic material to increase growth rate, ratio of protein to fat in carcasses, milk production, and disease resistance. Also, maintenance of the genetic diversity of germplasm within and between species is necessary so that specific genes and gene complexes can be drawn from the pool of genetic variability. The conservation of genetic diversity will provide optimum access to desirable genes that will be useful to researchers and benefit producers and breeders. National and international organizations must be involved to develop, direct, and coordinate programs that will ensure the maintenance of diversity in food-producing animals.

Nature of Change: Approximately 85 percent of the genes in swine and cattle are identical to those in the human. Therefore, much of the gene mapping in humans can be directly applied to livestock by establishing markers along the genome and comparing results directly to the human gene map. However, a considerable amount of specific gene mapping for cattle and swine will be required to delineate specific differences in gene structure and location as compared to the gene map of the human genome. When the genes or groups of genes that control specific diseases, external fat, marbling in cattle, tenderness, muscle development, milk composition, ovulation rate, and other traits of economic importance are located, the industry will be able to produce a competitive product for export and domestic markets.

New research will be initiated on germplasm preservation and cryopreservation of embryos and sex control of gametes; characterization and evaluation of new germplasm resources; gene mapping; gene identification and cloning; gene insertion and modification; and inventory and data base management of germplasm data. The objectives of the research are to: identify and clone DNA elements to alter genomes of farm animals and microbes to improve growth, milk and egg characteristics, reproductive traits, and disease resistance of livestock and poultry; develop physical and genetic maps of the genomes of selected major production-related genes and pathogens to identify gene coding for replication, potential protective antigens, and regulatory elements; identify new genes and clone new, previously characterized genes associated with growth, milk and egg production, and disease resistance; and improve efficiency of gene insertion and appropriate gene expression and physiology of resultant lines of transgenic animals.

(c) An increase of $1,087,000 which represents 50 percent of the 1991 pay raise. The remaining 50 percent of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(4) An increase of $11,935,000 for research on commodity conversion and delivery consisting of:

(a) An increase of $10,800,000 for research to assure food safety ($27,517,000 available in FY 1990).

Need for Change: The nation's consumers are becoming more concerned about the quality and safety of the food they eat, and food safety standards are becoming more stringent. Heightened consumer awareness of microbial and chemical contamination intensifies the need to assure the safety and quality of the food supply. Mycotoxins in particular have become increasingly important following the dry summer of 1988, the more stringent regulatory requirements of the EEC countries and the interest in toxic contaminants from individual states, e.g., California. There is need for national centrally directed research to efficiently attack these problems and provide workable solutions. This research directly supports the priority needs of the action agencies FSIS and AMS.

Nature of Change: Maintaining the safety of new minimally processed, fresh appearing products containing meat, vegetables, seafood, dairy products, etc. is an extremely challenging problem. ARS research will develop a model for the growth of problem pathogens in specific susceptible food products of widespread concern to determine the effects of variation of factors such as time, temperature including type of energy source, pH, additives, and water activity. These data will be used to implement the multi-barrier or hurdle concept of microbial pathogen control in these minimally processed foods and to aid in developing Hazard Analysis Critical Control Point (HACCP) monitoring by the food industry and the regulatory agencies. New food-borne pathogens will be characterized and accurate and efficient methods developed for their detection prior to inclusion in the modeling studies. These include the bacteria Escherichia coli 0157 and specific food and water-borne viruses. The control of Salmonella and other pathogens will be enhanced through the use of (1) non-pathogenic competitive bacteria in food and (2) sugars and specific bacteria in young chickens to regulate intestinal pH.

Animals may carry subclinical bacterial, mycotic and parasitic infections that can result in infected meat and poultry products. When consumed, these products can result in human illness. Control methods will be developed to eliminate Toxoplasma, Cysticerca and Salmonella in swine, cattle and poultry. Assuring Salmonella-free eggs is important because we are accustomed to consuming some foods containing undercooked or even raw eggs. ARS research will determine factors that affect the source of the contamination, colonization of the host and the transmission of infection from animal to animal and/or through primary or intermediate hosts. Methods will be developed to prevent Aspergillus flavus, aflatoxin and endophytes of grasses from contaminating animal feed, and thus prevent exposure to aflatoxin in both humans and animals.

Aflatoxin is the cause of increased losses in the marketing of corn, cottonseed, peanuts, tree nuts and/or milk in part because of new lower tolerances in the U.S. and in Europe. The nationally coordinated ARS research will utilize biotechnology in developing solutions to eliminate mycotoxins in marketed commodities, e.g., by enhancing host plant resistance to attack by aflatoxigenic fungi and, secondly, to reduce aflatoxin levels by introduction of biocompetitive agents. This work will also include determination of the ecological factors which affect the availability of the innoculum and the mechanism of innoculation of the toxic fungi to susceptible commodities.

Direct application of pesticides to food crops presents a potential food safety problem. Effective biological control of plant pests is needed to provide ecologically sound methods of pest control. Alternative pest control methods utilizing both natural enemies and resistant crop germplasm will be developed to replace chemicals, insecticides, fungicides, and nematocides removed from the marketplace because of potential contamination of food and other environmental concerns. On vegetables, important biological control targets for ARS research are: aphids, mealybugs, beetles, diamond back moth, and sweet potato whitefly. Nonchemical control of codling moth is the key to controlling other fruit pests by beneficial organisms. Genetic modification of plants will be explored utilizing satellite viruses, cross protection to develop transgenic plants. Also insect bacterial toxin genes will be used to provide transgenic plants (resistant to insects). Targets for this results oriented research are cucumber mosaic virus, citrus tristeza virus, European corn borer and Colorado potato beetle.

Detection of drugs and other chemicals at the low part per billion levels requires a sequence of steps often developed by trial and error for the isolation of drug from the meat matrix, to remove interfering substances and for the analytical step. ARS research will combine modeling with expert systems approaches to expeditiously design entire drug analytical schemes. This computer-aided research will enable much of the lengthy experimental process to be circumvented. Practical development of these sophisticated new techniques will be supported by the identification and quantification of metabolites in animals, improved rapid clean-up procedures utilizing the newly developed bioaffinity techniques, and the production of incurred residues for checking the applicability and accuracy of the methodology.

(b) An increase of $1,135,000 which represents 50 percent of the 1991 pay raise. The remaining 50 percent of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(5) An increase of $154,000 for research on human nutrition consisting of:

(a) An increase of $154,000 which represents 50 percent of the 1991 pay raise. The remaining 50 percent of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(6) An increase of $120,000 for research on integration of agricultural systems consisting of:

(a) An increase of $120,000 which represents 50 percent of the 1991 pay raise. The remaining 50 percent of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(7) A decrease of $7,550,000 for repair and maintenance of Federal facilities ($24,914,000 available in FY 1990).

Need for Change: The FY 1991 Budget recommends a change in budgeting for major projects carried out for the renovation of the Beltsville Agricultural Research Center (BARC). The change results in a reduction of $7,550,000 from the Salaries and Expenses appropriation for repair and maintenance activities carried out at BARC and a concurrent increase of $16,000,000 under the Buildings and Facilities Appropriation for Beltsville modernization. The nature and complexity of designing, planning, renovation, etc., the numerous facilities, roads and other capital assets under the BARC project require that resources be available beyond a one-year time period. The Buildings and Facilities Appropriation is established for major construction projects and is the appropriation subject to the General Provisions which accompany the Appropriation Act and which generally provide that funds under this account be available until expended. Prudent management requires that these funds be available, if necessary, beyond the fiscal year in which they are appropriated.

Nature of Change: In FY 1991 funding in the amount of $7,550,000 will be reduced under the Salaries and Expenses Appropriation for the Beltsville Agricultural Research Center, Beltsville, Maryland. Additional funds for BARC modernization, $16,000,000, are requested under the ARS Buildings and Facilities Appropriation. These actions will provide for a more flexible and effective management implementation of BARC construction, repair, renovation and modernization needs. Additional funds remain available in the Salaries and Expenses Appropriation for BARC and other ARS research facilities under the line item "Repair and Maintenance of Facilities" for routine repair and energy retrofit projects which can be efficiently planned and contracted for during the fiscal year.

Further, the overall BARC modernization plan recommends new construction, rather than alterations, as a more cost-effective means of providing certain facilities. Authority for major new construction projects is available through the Buildings and Facilities account.

CONTINGENCY RESEARCH FUND

The Contingency Research Fund, established by Congress in Fiscal Year 1962, is designed to provide a ready source of funds to meet unforeseen and immediate research needs. Releases from the fund are generally made in situations where an emergency exists, or for special needs such as an unexpected scientific "breakthrough," or for new diseases or pest problems where it appears inadvisable to wait for consideration of a request for funds for the project in the regular budget process. In allocating funds, the procedure is to make no commitments for allocations from the fund beyond the current year.

	1989 Obligations
Emergency cleanup of mercury contamination, Albany, California	$26,500
Replacement of HVAC system at Byron, Georgia	70,000
Supplement feed for sheep, snow removal, and storm damage repairs, Dubois, Idaho	43,000
Rebuild and replenish bee hives lost during a recent storm, Baton Rouge, Louisiana	15,000
Repair feed mill damaged by wind storms, Miles City, Montana	8,400
Replace fire door for Building 101 at Plum Island Animal Disease Center to meet safety requirements, Greenport, L.I., New York	12,000
Replacement costs for two barns destroyed by tornado, El Reno, Oklahoma	31,226
Repair damages caused by vandalism, fire, and smoke to the Microbial Food Safety Research Laboratories, Eastern Regional Research Center, Wyndmoor, Pennsylvania	267,000
Replace roofs on greenhouse destroyed by hail storm, Brookings, South Dakota	37,000
Replacement of stolen office equipment, Weslaco, Texas	10,000
Purchase security equipment: security alarms and chain-link metal fencing for protecting location property and providing a less hazardous workplace, Weslaco, Texas	78,442
Repairs and replacement of roofs on two buildings at complex, damages caused by major hail storm, Bushland, Texas	32,051
Repairs and replacement of facilities. Damages caused by hurricane Hugo, St. Croix, Virgin Islands	310,881
Total, 1989 Obligations	941,500

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1989		Estimated 1990		Estimated 1991	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
ALABAMA, Auburn........	$2,610,069	47	$2,429,500	47	$2,654,500	47
ALASKA, Fairbanks......	707,128	8	703,900	8	703,900	8
ARIZONA						
Phoenix..............	4,944,500	109	4,832,500	109	5,687,500	109
Tucson...............	3,944,455	75	3,510,500	75	3,690,500	75
Total........	8,888,955	184	8,343,000	184	9,378,000	184
ARKANSAS						
Booneville...........	980,589	18	1,115,100	18	1,115,100	18
Stuttgart............	421,808	5	356,100	5	356,100	5
Total........	1,402,397	23	1,471,200	23	1,471,200	23
CALIFORNIA						
Albany...............	19,646,509	280	18,410,600	280	18,950,600	280
Brawley..............	301,751	8	289,700	8	289,700	8
Davis................	1,427,577	21	1,354,300	21	1,534,300	21
Fresno...............	3,828,239	68	3,375,600	68	3,375,600	68
Pasadena.............	1,483,070	26	1,432,600	26	1,432,600	26
Riverside............	2,874,170	49	2,971,000	50	2,971,000	50
Salinas..............	1,682,757	35	1,715,200	35	1,715,200	35
San Francisco........	3,827,720	39	4,221,100	40	4,221,100	40
Shafter..............	1,215,375	20	1,168,600	20	1,168,600	20
Total........	36,287,168	546	34,938,700	548	35,658,700	548
COLORADO						
Akron................	734,796	15	719,500	15	719,500	15
Fort Collins.........	8,512,716	147	8,855,800	147	9,305,800	147
Total........	9,247,512	162	9,575,300	162	10,025,300	162
DELAWARE						
Georgetown...........	779,407	13	724,200	13	724,200	13
Newark...............	634,964	13	560,500	13	560,500	13
Total........	1,414,371	26	1,284,700	26	1,284,700	26
DISTRICT OF COLUMBIA						
Program..............	3,699,892	65	3,669,500	65	3,669,500	65
Headquarters						
Federal Administration.....	28,936,617	499	30,812,400	499	30,812,400	499
Centrally Financed Services....	8,315,687	- -	8,447,100	- -	8,447,100	- -
Subtotal......	37,252,304	499	39,259,500	499	39,259,500	499
Total........	40,952,196	564	42,929,000	564	42,929,000	564
FLORIDA						
Brooksville..........	446,382	10	626,600	10	626,600	10
Canal Point..........	854,794	20	894,500	20	894,500	20
Fort Lauderdale......	677,814	13	638,700	13	638,700	13
Gainesville..........	8,708,955	157	8,365,900	157	9,310,900	157
Miami................	1,508,578	30	1,589,200	30	1,589,200	30
Orlando..............	3,915,723	64	3,907,400	64	4,087,400	64
Winter Haven.........	1,146,923	16	1,204,400	16	1,204,400	16
Total........	17,259,169	310	17,226,700	310	18,351,700	310

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1989		Estimated 1990		Estimated 1991	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
GEORGIA						
Athens................	12,471,953	192	13,073,000	192	14,333,000	192
Byron.................	1,955,734	43	1,928,700	43	1,928,700	43
Dawson................	1,374,707	27	1,368,900	27	1,728,900	27
Experiment............	1,461,673	8	1,404,800	8	1,404,800	8
Savannah..............	2,600,886	52	2,605,900	52	2,605,900	52
Tifton	6,564,215	101	6,469,900	101	7,324,900	101
Watkinsville..........	1,975,472	27	1,731,000	27	1,731,000	27
Total........	28,404,640	450	28,582,200	450	31,057,200	450
HAWAII, Honolulu.......	6,133,152	65	7,067,800	65	7,067,800	65
IDAHO						
Aberdeen..............	1,296,775	11	1,807,500	12	1,807,500	12
Boise.................	1,096,966	17	1,032,700	17	1,032,700	17
Dubois................	1,734,918	11	1,811,600	11	1,811,600	11
Kimberly..............	2,190,157	41	2,176,200	41	2,176,200	41
Total........	6,318,816	80	6,828,000	81	6,828,000	81
ILLINOIS						
Peoria................	19,955,341	317	20,683,800	317	21,223,800	317
Urbana................	3,471,565	49	3,314,400	49	3,584,400	49
Total........	23,426,906	366	23,998,200	366	24,808,200	366
INDIANA, Lafayette.....	3,235,023	42	3,062,100	42	3,242,100	42
IOWA, Ames/Ankeny......	19,110,305	328	21,904,300	328	23,209,300	328
KANSAS, Manhattan......	4,246,224	64	3,834,700	64	3,834,700	64
KENTUCKY, Lexington....	972,552	16	933,200	16	933,200	16
LOUISIANA						
Baton Rouge...........	1,759,179	34	1,713,700	34	1,893,700	34
Houma.................	1,316,601	33	1,299,800	33	1,299,800	33
New Orleans...........	16,267,436	243	15,520,000	243	15,880,000	243
Total........	19,343,216	310	18,533,500	310	19,073,500	310
MAINE, Orono...........	510,681	6	433,000	6	433,000	6
MARYLAND						
Beltsville............	76,993,798	1,286	75,237,600	1,287	79,265,100	1,287
Frederick.............	2,090,640	41	2,085,400	41	2,085,400	41
Hyattsville...........	419,652	8	493,100	8	493,100	8
Total........	79,504,090	1,335	77,816,100	1,336	81,843,600	1,336
MASSACHUSETTS, Boston..	13,222,293	3	13,544,800	3	13,544,800	3
MICHIGAN, East Lansing.	3,324,200	58	3,351,400	58	3,711,400	58

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1989		Estimated 1990		Estimated 1991	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
MINNESOTA						
East Grand Forks.....	892,046	8	1,051,500	8	1,051,500	8
Morris...............	2,524,135	33	2,328,900	33	2,328,900	33
St. Paul.............	3,626,416	41	3,443,300	41	3,623,300	41
Total........	7,042,597	82	6,823,700	82	7,003,700	82
MISSISSIPPI						
Mississippi State....	6,440,306	115	6,033,000	115	6,213,000	115
Oxford...............	4,449,768	64	4,423,000	64	4,423,000	64
Poplarville..........	631,357	12	638,400	12	638,400	12
Stoneville...........	10,743,400	188	11,201,600	189	11,381,600	189
Total........	22,264,831	379	22,296,000	380	22,656,000	380
MISSOURI, Columbia.....	4,495,422	81	4,020,300	81	4,200,300	81
MONTANA						
Bozeman..............	1,355,360	25	1,432,700	25	1,432,700	25
Miles City...........	1,775,196	11	1,668,900	11	1,668,900	11
Sidney...............	565,576	10	429,700	10	429,700	10
Total........	3,696,132	46	3,531,300	46	3,531,300	46
NEBRASKA						
Clay Center..........	9,074,310	59	9,657,300	59	11,074,800	59
Lincoln..............	3,045,482	41	2,996,300	41	2,996,300	41
Total........	12,119,792	100	12,653,600	100	14,071,100	100
NEVADA, Reno...........	622,822	8	608,700	8	608,700	8
NEW JERSEY						
Chatsworth...........	336,707	2	500,000	2	500,000	2
NEW MEXICO						
Las Cruces...........	1,276,802	25	1,373,900	25	1,373,900	25
NEW YORK						
Geneva...............	1,351,899	9	1,111,000	9	1,111,000	9
Ithaca...............	3,662,747	37	3,253,700	37	3,883,700	37
Plum Island..........	8,881,896	198	8,763,800	198	8,763,800	198
Total........	13,896,542	244	13,128,500	244	13,758,500	244
NORTH CAROLINA						
Oxford...............	2,307,437	33	2,224,000	33	2,224,000	33
Raleigh..............	4,730,440	69	4,445,300	69	4,670,300	69
Total........	7,037,877	102	6,669,300	102	6,894,300	102
NORTH DAKOTA						
Fargo................	8,029,193	121	8,331,900	121	8,601,900	121
Grand Forks..........	6,377,052	32	6,593,200	32	6,593,200	32
Mandan...............	2,360,830	49	2,430,500	49	2,430,500	49
Total........	16,767,075	202	17,355,600	202	17,625,600	202

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1989		Estimated 1990		Estimated 1991	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
OHIO						
Columbus..............	323,162	4	420,700	4	420,700	4
Coshocton............	989,244	16	1,015,600	16	1,015,600	16
Delaware.............	571,782	7	315,500	4	315,500	4
Wooster..............	1,933,399	35	2,037,100	35	2,037,100	35
Total........	3,817,587	62	3,788,900	59	3,788,900	59
OKLAHOMA						
Durant...............	1,962,829	38	1,962,800	38	2,142,800	38
El Reno..............	1,854,129	27	1,591,900	27	1,591,900	27
Lane.................	1,519,574	13	1,651,300	13	1,651,300	13
Poteau...............	143,507	1	- -	- -	- -	- -
Stillwater...........	1,886,760	31	2,234,300	31	2,234,300	31
Woodward.............	1,008,683	16	960,900	16	960,900	16
Total........	8,375,482	126	8,401,200	125	8,581,200	125
OREGON						
Burns................	330,774	3	331,100	3	331,100	3
Corvallis............	4,038,270	42	3,580,500	42	3,580,500	42
Pendleton............	1,104,253	21	1,058,800	21	1,058,800	21
Total........	5,473,297	66	4,970,400	66	4,970,400	66
PENNSYLVANIA						
University Park......	2,886,731	47	2,719,800	47	2,719,800	47
Wyndmoor.............	16,658,886	237	17,048,200	237	17,948,200	237
Total........	19,545,617	284	19,768,000	284	20,668,000	284
SOUTH CAROLINA						
Charleston...........	2,384,878	41	2,133,300	41	2,133,300	41
Clemson..............	1,714,031	28	1,683,500	28	1,683,500	28
Florence.............	1,784,668	37	1,628,700	37	1,988,700	37
Total........	5,883,577	106	5,445,500	106	5,805,500	106
SOUTH DAKOTA						
Brookings-Madison....	1,735,520	35	1,635,300	35	1,635,300	35
TENNESSEE						
Greeneville..........	48,613	1	- -	- -	- -	- -
Jackson..............	158,206	2	132,900	2	132,900	2
Lewisburg............	142,702	2	141,800	2	141,800	2
Total........	349,521	5	274,700	4	274,700	4
TEXAS						
Beaumont.............	763,112	15	740,400	15	740,400	15
Brownwood............	549,212	11	547,300	11	547,300	11
Bushland.............	2,194,130	46	2,119,300	46	2,119,300	46
College Station......	9,472,024	162	9,436,200	162	9,976,200	162
Houston..............	8,334,643	2	9,631,300	2	9,631,300	2
Kerrville............	2,373,230	52	2,441,300	52	2,621,300	52
Lubbock..............	2,675,515	51	2,545,600	51	2,545,600	51
Temple...............	2,568,258	58	2,480,000	58	2,705,000	58
Weslaco..............	6,139,158	109	5,795,700	109	6,065,700	109
Total........	35,069,282	506	35,737,100	506	36,952,100	506

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1989		Estimated 1990		Estimated 1991	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
UTAH, Logan............	3,234,327	54	3,516,000	54	3,741,000	54
VIRGINIA						
Suffolk	560,143	11	482,800	11	482,800	11
WASHINGTON						
Prosser..............	2,356,062	46	2,109,000	46	2,109,000	46
Pullman..............	6,360,735	89	5,791,100	89	5,971,100	89
Wenatchee............	1,067,863	25	1,065,200	25	1,065,200	25
Yakima...............	2,400,803	53	2,443,000	53	2,623,000	53
Total........	12,185,463	213	11,408,300	213	11,768,300	213
WEST VIRGINIA						
Beckley...............	2,692,795	41	2,897,400	41	2,897,400	41
Kearneysville.........	3,624,485	48	3,561,200	48	3,561,200	48
Total........	6,317,280	89	6,458,600	89	6,458,600	89
WISCONSIN, Madison.....	4,834,511	56	4,690,100	56	4,690,100	56
WYOMING						
Cheyenne.............	664,217	16	661,400	16	661,400	16
Laramie..............	1,961,366	28	1,917,000	28	1,917,000	28
Total........	2,625,583	44	2,578,400	44	2,578,400	44
PUERTO RICO						
Mayaguez.............	1,907,362	48	1,927,000	48	2,084,500	48
VIRGIN ISLANDS						
St. Croix............	756,747	5	206,800	5	364,300	5
OTHER COUNTRIES						
Argentina, Buenos Aires.......	197,859	- -	147,500	- -	147,500	- -
France, Behoust......	932,449	3	801,900	3	801,900	3
Italy, Rome..........	692,720	1	534,800	1	534,800	1
Korea, Seoul.........	162,717	1	148,000	1	148,000	1
Mexico, Tuxtla Gutierrez..........	922,957	8	885,600	8	885,600	8
Netherlands, Rotterdam..........	342,581	1	300,400	1	300,400	1
Total........	3,251,283	14	2,818,200	14	2,818,200	14

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1989		Estimated 1990		Estimated 1991	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
Extramural and Funds Administered from Headquarters....	8,301,344	- -	27,860,900	- -	47,479,900	- -
Contingency Research Fund.................	[a]	- -	928,500	- -	928,500	- -
Repair & Maintenance of Facilities........	20,843,742	- -	24,913,800	- -	17,363,800	- -
Unobligated Balance....	1,879,235	- -	- -	- -	- -	- -
Subtotal, Available or Estimate..........	563,024,565	7,988	585,562,700	7,988	617,701,700	7,988
Allotment to Forest Service.......	356,435	- -	360,300	- -	360,300	- -
Transfer to APHIS......	- -	- -	223,000	- -	- -	- -
Pro-rata reduction P.L. 99-177..........	- -	- -	8,193,000	- -	- -	- -
Pay Costs..............	- -	- -	- -	- -	5,448,000	- -
TOTAL, Appropriation...	563,381,000	7,988	594,339,000	7,988	623,510,000	7,988

[a] Obligations incurred in 1989 under the Contingency fund in the amount of $941,500 are reflected in the locations above.

AGRICULTURAL RESEARCH SERVICE

STATUS OF PROGRAM

Current activities, progress, and current programs under each project are outlined below:

RESEARCH ON SOIL AND WATER CONSERVATION

Current Activities: Management guidelines, practices, and systems are being developed for profitable options by agricultural producers and for promoting conservation of the quality and production capacity of our Nation's soil, water, and air resources for future generations. The research program stresses the development of resource management systems that farmers, extension specialists, and agri-industry can use to maintain and enhance farm profitability while minimizing adverse impacts on long-term productivity and the environment. Investigations include research aimed at assessing the effects of agricultural activities on the quality and productivity of the natural resource base and on changes in the quality of the resource base on the profitability and productivity of agriculture. Emphasis is given to the development of management practices that reduce soil erosion, improve soil fertility, maintain an optimum physical and biological soil environment for plant growth, and conserve the quality and quantity of the Nation's surface water and groundwater resources. Research is also conducted to ensure that soil and water conservation strategies are consistent with the productivity goals of U.S. agriculture and the long-term profitability of farming. Emphasis is being placed on water quality protection, sustainable agriculture, and an improved understanding of the impact of global change on the environment, agricultural productivity, and resource conservation and protection.

Selected examples of recent progress:

Erosion prediction model delivered to Soil Conservation Service. Existing technology for estimating soil loss from agricultural lands is not adequate to meet the changing needs of agriculture. Traditional methods of adapting current technology to cope with changes in farm, range, and forest management practices, and with new and more demanding regulatory policies are too slow and too expensive. An interdisciplinary group of scientists drawn from ARS and several other federal agencies have developed a new technology designed to meet the needs of resource managers into the 21st century. The benefits to the user community will be greater flexibility and adaptability to changing needs, improved water erosion prediction, and a better understanding of the long-term impacts of erosion on landscape productivity and water quality. An erosion prediction model incorporating the new technology, and designed for use on personal computers, was developed and released to the Soil Conservation Service for testing, modification, and training.

Ephemeral gully erosion can be a major source of sediment. Concentrated flows in upland watersheds promote the development of ephemeral gullies. These ephemeral gullies, which are eroded channels formed during the crop growing season and temporarily destroyed by cultivation, have been shown to be a major potential source of sediment. Field experiments, conducted on a loess-capped upland soil east of the Mississippi river flood plain, show that for a conventionally tilled soybean field the soil loss resulting from the development of ephemeral gullies averaged 5.3 tons per acre. This was about 60 percent of the total annual soil loss. Soil loss estimators that exclude losses associated with the development of ephemeral gullies may seriously underestimate the magnitude of on-site and off-site damages.

Grouping of soils and pesticides will increase the efficiency of water quality planning. Many State and federal agencies are faced with the challenge of developing water quality strategies and plans for reducing pesticide contamination of the Nation's water resources. These plans must consider the diversity of soils, climates, management systems, and pesticides. With more than 1500 dominant cropland soil series, and a large number of active ingredients in commercial pesticides, the task facing these agencies is formidable. In response to a request from the Soil Conservation Service, ARS scientists have succeeded in grouping soils and pesticides into behavioural classes based on soil taxonomy and the persistence and solubility of pesticides. This classification system will materially assist agencies in meeting their responsibilities for water quality protection.

Computer model estimates potential leaching of nitrate under agricultural crops. A computer model N-LEAP (Nitrate Leaching and Economic Analysis Package) has been developed to provide rapid, site-specific estimates of the potential leaching of nitrate to groundwater under agricultural crops. The model is based on the contributions of water and nitrogen management specialists from universities, ARS, and other federal agencies. Site-specific information on farm management practices, crops, soils, climates, and economics is used to assess the economic and water quality consequences of adjusting nitrogen sources and application rates. N-LEAP, which is designed for use by farmers, farm consultants, extension agents and resource planners, can be run on any IBM compatible personal computer.

When the conversion of ammonium nitrogen to nitrate is blocked, it is not leached out of the root zone. This conversion, called "nitrification," was blocked by acetylene which was produced by water diffusing through wax coatings into carbide pellets. The acetylene diffused slowly out through the coating and into the soil. A few kilograms of carbide per acre are sufficient to block this conversion for most of a cropping season. These basic processes can be used to avoid leaching of fertilizer nitrogen to the water table and keep it within reach of the plant roots. A reasonably priced means for coating the carbide pellets would make this process economically feasible.

Ryegrass and cereal rye are more efficient than legumes in recycling nitrogen fertilizer. The leaching of residual nitrate in the soil during the non-crop period has been identified as a major contributor to groundwater contamination by nitrate. By reducing the buildup of nitrate in cropland soils, winter cover crops have the potential to reduce nitrate leaching. Collaborative work with the University of Maryland has established that ryegrass and cereal rye are four times more efficient than the legumes hairy vetch and crimson clover in recycling nitrogen fertilizer and preventing it from leaching to groundwater. An isotopic form of nitrogen was used to track the movement of commercial fertilizer applied to the previous corn crop. Cereal rye and ryegrass took up 40 percent of the residual nitrate in the top two feet of the soil prior to the planting of these cover crops. Hairy vetch and crimson clover took up only 10 percent.

Wise management of symbiotically fixed nitrogen protects groundwater quality and reduces production costs. Research at Kimberly, Idaho has shown that wheat, barley, or corn can be grown successfully, with or without tillag and with little or no supplemental nitrogen fertilizer, if the preceding alfalfa crop in the cropping sequence is killed by tillage or herbicides Wise management of nitrogen sources was shown to be the key to successful utilization of the nitrogen released by decomposition of the alfalfa and to reduced nitrate leaching. By adjusting the cropping sequence to optimize use of the symbiotically fixed nitrogen, operator input costs were reduced by $50 to $80 per acre each year. Nitrogen fertilizer use was also reduced by 300 to 400 pounds per acre over a five year cropping sequence.

New automated layflat irrigation tubing is ready for commercial use. A layflat irrigation tubing system has been developed as a low-cost alternative to labor-intensive gated pipe systems. The layflat tubing was constructed with an interior membrane where a single tube serves for both water conveyance and distribution. Manual and automated valves have been developed so that the irrigator can open or close as many as 200 or more gates at one time. The irrigation tubing and automated devices are ready for commercial manufacturing and sales to other countries. The equipment can be used on as much as 22 million acres of U.S. farmland currently irrigated by siphon tubes and gated pipes.

Ozone damage to crops will be mitigated by rising carbon dioxide (CO_2). Increasing CO_2 in the atmosphere allows plants to get adequate carbon into their leaves with decreased stomatal openings. Most crop species have evolved mechanisms which take advantage of that fact and close their stomates to minimize water loss when the supply of CO_2 in the leaves is adequate. A computer model of this process shows that this partial closure of the stomates will also reduce entry of ozone and other atmospheric pollutants. Since ozone is currently causing considerable damage to leaves and other plant tissues in many parts of the U.S., an increase in CO_2 could increase yields of ozone affected crops such as soybeans by as much as 15 percent.

Mycoherbicide with invert emulsion shown to be an effective biocontrol agent of weeds. Herbicides are widely perceived as a greater threat to water quality than insecticides and fungicides. Unfortunately, their replacement by biological agents presents agricultural science with a major challenge. Greenhouse tests have previously shown that the fungus Colletotrichum truncatum (COLTRU) has potential as a mycoherbicide for controlling hemp sesbania. More recent tests with COLTRU and with other mycoherbicides have indicated that by formulating the pathogen with an invert (water droplets in oil) emulsion, a much shorter dew period is required for infection and kill of weeds to occur. The best control (95%) occurred in plots treated with COLTRU + invert. This was comparable to the control (96%) achieved in plots treated with the herbicide acifluorfen ('Blazer') at recommended field rates. By comparison, only 10% hemp sesbania control occurred in plots treated with COLTRU alone.

Energy balance model used to estimate crop transpiration. Equipment designed to directly measure transpiration rates and stomatal resistance of plant leaves is somewhat tedious and costly. To evaluate the crop water stress for scheduling irrigations, easier, quicker, and cheaper methods are needed. Scientists at Phoenix, Arizona, have developed a remote, non-invasive technique for measuring leaf transpiration and stomatal resistance using an energy balance model. The method uses leaf temperatures measured with an infrared radiometer. The method shows promise for application by growers.

RESEARCH IN PLANT SCIENCES

Current Activities: The research program places emphasis on reducing the unit costs of producing our major crop commodities and improving quality to meet processor and consumer needs. This research will maintain and improve the competitiveness of our agricultural products in domestic and world markets. In addition, improved fruit, vegetables, and ornamental crops are being developed. Special attention is being given to the collection, evaluation, and preservation of crop germplasm and to increasing the genetic diversity of the crop base. New technologies for gene transfer and expression are being developed and applied to improve germplasm. Our National Plant Germplasm System provides the base genetic material to develop new crop varieties resistant to diseases and insects, tolerant to drought and other climatic stresses, and with improved consumer acceptance. New methods are being developed for suppression and biocontrol of insects, nematodes, weeds, and diseases. These technologies will reduce crop protection costs, avoid contamination of our soil, air, and water resources, and help assure food quality in the marketplace.

Selected examples of recent progress:

Foot rot resistant wheat varieties lower production cost $20 per acre. Strawbreaker foot rot is the most devastating soilborne wheat disease in the

Pacific Northwest. ARS plant scientists at Pullman, Washington, have developed the first wheat varieties with resistance to strawbreaker foot rot. Using introduced germplasm from France, they transferred a gene derived from a weedy relative of wheat into both a common and a club soft white winter wheat variety. By planting the resistant varieties, farmers can lower their production costs by about $20 per acre and use less pesticides at the same time. Working with a Georgia State University biochemist, the Pullman scientists discovered that the gene for foot rot resistance was closely linked to a gene that produces a unique enzyme. Plants can now be rapidly screened for presence of this enzyme with good assurance that they also possess foot rot resistance.

An adult suppression system for the "billion dollar" insect pest. ARS scientists located at Brookings, South Dakota, have developed a novel adult suppression system for management of corn rootworm populations. The new technology uses a combination of semiochemical attractants and feeding stimulants along with a small dose of insecticide in a novel delivery device. It is estimated that use of the device for corn rootworm management should result in a decrease of chemical insecticide use of upwards to 100-fold. Only fields exceeding certain established thresholds would require chemical application. The new system will greatly reduce human exposure and environmental contamination by chemical pesticides presently being used to control this major insect pest. Additionally, the device which contains a bait and attracts only corn rootworms would have little if any effect on beneficial insects.

A non-insecticidal solution to peach growers top insect problem. Peach tree borers cause an estimated annual loss to the U.S. peach industry of over $20 million. ARS scientists at Byron, Georgia, have identified a means to inhibit mating in these insects. Dispensers containing a peach tree borer sex pheromone are being used to attract males who make futile attempts to mate with the dispensers. Female peach tree borers consequently remain unmated and fail to yield offspring that can devastate an orchard. Pheromones, unlike chemical pesticides, leave no toxic residues and are cost-competitive.

Menthol for control of tracheal mites. Tracheal mites, parasites of the honey bee, were discovered in the United States for the first time in July 1984, and since then have contributed to the death of thousands of honey bee colonies. Using leads provided by Italian cooperators, ARS scientists from Weslaco, Texas, and Beltsville, Maryland, worked cooperatively to develop the necessary efficacy and residue data to successfully petition the EPA for the registration of menthol. In cooperation with the American Honey Producers Association and the Interregional-4, ARS scientists helped prepare the final label that was registered by the EPA. Menthol is the only product currently available for the control of tracheal mites. Scientists at Beltsville, working with the New Jersey Department of Agriculture, developed specific information on the placement of menthol for optimum results in Northern climates and the same was done in Weslaco, Texas, for tropical areas. It is estimated that as much as 50 tons of menthol may be used by beekeepers to treat their colonies.

Free exchange of plant germplasm benefits U.S. and world agriculture. With about 99 percent of U.S. crop acreage being planted to crops not native to this country, U.S. agriculture is thus about 99 percent dependent on introduced germplasm. There are now 373,498 plant germplasm samples listed in the computer database of the National Plant Germplasm system with additional entries to be made. In 1988, 13,231 new germplasm accessions were added to the U.S. collection and 149,485 germplasm samples were distributed to plant breeders and other users. Over 20 percent of these distributions were sent to 95 foreign countries where scientists use this preserved germplasm to improve their own agriculture. Such examples of free exchange of germplasm benefits both U.S. and world agriculture.

New plant introductions improve profitability and reduce pesticide use. Over the last 5-year period, ARS has made 599 introductions of new crop varieties and germplasm lines, all of which have improvements for environmental stress factors, consumer quality, or resistance to disease, insect, and nematode pests. Of these, 483 had improved resistance to diseases, 184 have improved resistance to insects, and 55 have improved resistance to nematodes. Over 83 percent of these introductions are germplasm lines which are then used by State and private plant breeders to develop improved varieties for specific crop production areas. Approximately 80 percent of these introductions are made in cooperation with State and industry organizations. Such releases will help reduce pesticide use on U.S. crops.

New carrot variety helps maintain health. Globally, vitamin A deficiency has been identified as one of the most common dietary problems, ranking behind total energy and protein deficiencies. In the United States, many people are also deficient in vitamin A. Carrots now account for about 14 percent of the vitamin A in U.S. diets. Beta III, a new carrot variety rich in beta carotene, is now receiving high marks for flavor and good growth in diverse geographical settings. This carrot, developed by ARS scientists, provides hope for improved nutrition - eye health and disease resistance - throughout the world. Beta III is 3 to 5 times richer than most other carrots in beta carotene. Favorable reports have come from agricultural scientists in 15 of 16 developing countries who received generous amounts of free seeds from a U.S. seed company. A square foot of land typically produces slightly more than a dozen of the new carrots, enough to meet an adult's vitamin A needs for about a month.

New orange variety Ambersweet may reduce import of orange juice. U.S. orange juice imports totaled about $353 million in 1987-88, mostly from Brazil. A new orange hybrid developed by ARS scientists in Florida is expected to help growers and processors reduce U.S. dependence on imported juice. Juice from Ambersweet, the new orange hybrid, exceeds Federal color standards for Grade A juice. It can be mixed with other domestic orange juices that do not quite make the grade. This should help processors who must now import and store juice to mix with Hamlin and other orange varieties. Ambersweet, which matures earlier than most other varieties, is also ideal for the fresh market. Test-grown in two areas of Florida since 1974, it should be available from commercial nurseries in 1990.

A new nematode-resistant soybean variety introduced which will reduce losses caused by the soybean cyst nematode. Soybean cyst nematodes infest as much as 70 percent of the soybean acreage in the Mid-South and Southeastern United States. The nematodes penetrate the roots of soybean plants and reduce yields as much as 40 percent. ARS scientists developed a new soybean variety named Cordell which is resistant to the soybean cyst nematode. Cordell grows best in Virginia, North Carolina, Tennessee, southern Missouri, Arkansas, northern Mississippi, Alabama, and parts of South Carolina where soybean growers can expect reduced crop losses to the soybean cyst nematode.

Apple bruise prediction with instrumented sphere. Apples purchased in retail stores are usually bruised from hitting hard surfaces during packaging and handling. ARS and Michigan State University scientists have developed an electronic sphere to record the impacts caused by commercial packing lines. Real apples were exposed to the same kind of impacts in laboratory tests. The results are used to identify the impact threshold at which apple tissue becomes bruised. This information can then be used by manufacturers of handling and packaging equipment to develop improved handling procedures and cushioning materials which will reduce bruise damage and maintain apple quality. Research with this sphere will ultimately allow consumers to benefit from reduced damage in other produce such as grapefruit, melons, peaches, oranges, tomatoes, and potatoes.

Drought resistant soybean discovered. Soybean yields are reduced by lack of moisture or drought stress during the seed filling period. ARS scientists at Raleigh, North Carolina, have found an exotic Japanese soybean with extraordindary resistance to drought. Two mechanisms give the soybean its drought tolerance - a much deeper root system and a special chemical adjustment in the leaves which promotes water retention and prevents wilting. Under extreme water stress, this soybean yields up to 25 percent more than some of the best yielding varieties grown in the Southeast.

New mold strain is a promising biological control agent that should reduce the use of fungicides on a wide range of crops. Rhizoctonia and Pythium, two destructive soilborne fungi which cause great damage on many economic plants including ornamentals such as zinnia, poinsettia, marigold, and snapdragon, are controlled by use of large amounts of broad-spectrum fumigants such as methyl bromide, EBDCs, or pasteurized soil. Scientists at Beltsville, Maryland, have isolated a new strain of a beneficial mold, Gliocladium virens. This new strain, designated Gl-21, has considerable ability to suppress the two pathogens in soil and soilless mixes. It is expected that strain Gl-21 will eventually be used to manage soilborne diseases of vegetable and ornamental crops thereby reducing the need to use large amounts of fungicides.

New biological control formulations show promise for controlling fungal diseases of a wide variety of crops. Biocontrol of plant diseases with beneficial molds and bacteria is hindered because the end product formulations of beneficial microorganisms are not available. It is important to develop commercial formulations which can be effectively applied to residential and commercial lawns and turf and intensively grown crops to replace fungicides that are known to contaminate groundwater and to enter the food chain. ARS scientists at Beltsville, Maryland, developed viable, stable, and non-polluting products adaptable to commercial production. These formulations contain beneficial microorganisms which kill several important destructive plant pathogens and prevent diseases on economic crops such as cotton, potato, bean, sugarbeet, and ornamentals.

New cotton line developed with resistance to the pink bollworm. Control of the pink bollworm in cotton requires the repeated application of expensive chemical insecticides. Plant breeders and entomologists at the Western Cotton Research Laboratory in Phoenix, Arizona, have released a cotton germplasm line that offers greater resistance to this pest. A pilot test near Brawley, California, showed that a planting of the experimental line resulted in $80 per acre savings in pink bollworm control and outyielded the standard variety by 20 percent. Seed companies are using the germplasm line in their breeding programs to develop commercial varieties for specific production areas.

Soybean variety developed with adaptation to wide range of planting dates. Sensitivity to day length requires that, for acceptable yields, currently available soybean varieties can be planted only over a very narrow range of calendar dates. Cooperative research among ARS and State scientists in Mississippi, Florida, and Texas has developed a new variety, Padre, which can be planted over a range of planting dates from early May to early September. This is possible because of a gene transferred from a soybean introduction from Asia which is not adversely affected by changes in day length. The high-yielding Padre variety can be used for spring planting or for planting after sorghum harvest or early vegetables in the lower Rio Grande Valley.

RESEARCH IN ANIMAL SCIENCES

Current Activities: The research program places emphasis on reducing losses due to disease, improving the efficiency of livestock and poultry production, and reducing the amount of fat--while improving quality--of animal products used as food for humans. To reach these goals, new technology is needed on: the preservation and utilization of animal germplasm, genetic resistance to diseases, techniques to diagnosis, prevent, and treat diseases, and the detection and control of microbial and chemical residue contamination in live animals and animal products. The research is designed to solve short- and long-term, high-priority national problems and to meet the research needs of action and regulatory agencies. Current efforts to meet high-priority needs include research on the control of important diseases such as pseudorabies, brucellosis, Johne's disease, leptospirosis, bluetongue, avian influenza, and arthropod vectors of disease; technology to prevent introduction of foreign diseases of livestock and poultry; factors that influence reproductive efficiency; the study of pathology, toxicology, physiology, nutrition, genetics, biochemistry, and management.

Selected Examples of Recent Progress:

Unique swine germplasm imported from China. The USDA-ARS, in cooperation with Iowa State University (ISU) and the University of Illinois (UI), imported 144 pigs of the Meishan, Fengjing, and Ming breeds of swine from the People's Republic of China (PRC). ARS, ISU, and the UI shared equally in the cost of importation and received equal shares of the imported animals. The USDA-ARS research with the PRC swine will be conducted at the R.L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska. This is the first importation of these breeds which have been domesticated in China for over 6,000 years. The Chinese breeds, on average, produce 3-4 more pigs per litter than the average of U.S. domestic breeds. It has been estimated that at least 20-25 generations of conventional selection would be required with U.S. swine breeds to increase their litter size to the level routinely produced by the Chinese breeds. The Chinese breeds will be crossed with the U.S. breeds to increase litter size while maintaining the lean yield and quality of U.S. pork. The Chinese breeds will be thoroughly evaluated before release to the U.S. swine industry is considered.

Sex of farm animals controlled. The ability to predetermine the sex of offspring would offer the livestock industry increased efficiency, flexibility, and faster genetic progress in offspring. Studies conducted by ARS scientists at Beltsville, Maryland, with rabbits and pigs have resulted in production of live offspring from separate populations of X and Y chromosome-bearing sperm. Sex ratios of the offspring were significantly altered from the theoretical 50:50. In studies with rabbits, females were born more than 90 percent of the time when inseminations were made with X-sorted sperm, and males were born more than 80 percent of the time from Y-sorted sperm. Data from pigs are still incomplete but show a 73 percent proportion of males or females from Y- or X-sorted sperm. The sex ratios were predicted accurately by the reanalysis of DNA in the sorted sperm. This finding represents a breakthrough, in that predetermined sex was validated by birth of live offspring. This breakthrough moves us closer to a practical method for sexing livestock semen.

Predators of sheep controlled by guard dogs. Sheep ranchers have experienced heavy losses from predators since several States have restricted the use of other predator-control techniques. In Idaho alone, an estimated 23,400 sheep valued at $1.76 million were killed by predators in 1986. ARS scientists in Dubois, Idaho, initiated the program on use of guard dogs to control predators 10 years ago. In a recent national survey, 400 sheep and livestock producers reported that they were using 763 guard dogs. Reports were received from almost every State in the country. The greatest number of responses came from Texas, California, Washington, Oregon, and North Dakota. More than 80 percent of the ranchers surveyed indicated that the dogs and saved sheep were worth their initial cost of about $500, plus the feed cost of $1-$2 per day. The program has been an unqualified success at a time when sheep ranchers desperately need a non-lethal means of controlling sheep predation.

New technology to increase beef tenderness. Beef from Brahman and Brahman-cross cattle is less tender than beef from other U.S. breeds. Forty percent of the beef cattle in the United States have some Brahman breeding. A major portion of the reduced tenderness associated with Brahman breeding is a result of the beef not aging as rapidly as beef from other breeds. ARS scientists at the R.L. Hruska U.S. Meat Animal Research Center, Clay Center, Nebraska, have found that fortifying meat with calcium immediately postmortem will solve this problem. Additional calcium activates enzymes that enhance the aging process of beef, improving the tenderness of beef from Brahman cattle. Moreover, aging time of the beef can be reduced from 7 days to 1 day, greatly reducing the storage time associated with aged beef. Calcium levels in calcium-fortified beef are comparable to calcium levels in milk.

Salmonella colonization in broiler chicks can be blocked for just pennies per bird. Salmonella contamination of poultry products is an important public health concern. Humans can contract Salmonella infection from eating contaminated meat, resulting in diarrhea, vomiting, and/or nausea. ARS scientists at the Veterinary Toxicology and Entomology Research Laboratory, College Station, Texas, have found that adding 2.5 percent lactose (milk sugar) to the drinking water of 1-day-old chicks reduced the incidence of Salmonella colonization of the chicks, when challenged with 100 million Salmonella typhimurium bacteria, by 47 percent. Furthermore, the lactose-treated chicks that were colonized by Salmonella had 99.9 percent less Salmonella than chicks not given lactose. The lactose treatment could cost as little as 2 cents per bird.

A new parasitic disease. ARS scientists at Beltsville, Maryland, recognized and characterized a serious new parasitic disease, Neosporosis. The new organism, Neospora caninum, was confused with the long-known zoonotic parasite, Toxoplasma gondii. Neospora causes paralysis and death in dogs and cattle, and the disease is most severe in newborns. In cattle and sheep, it can also cause birth defects. The ultimate source of infection is not known, but the parasite can be transmitted from an infected mother to the fetus. In the laboratory, it can infect rodents, dogs and cats; thus, it might have a broad host range. The parasite was recently grown in cell cultures, enabling the scientists to develop diagnostic tests and to screen chemotherapeutic agents.

Gene probe for diagnosing anaplasmosis in cattle. Anaplasmosis, a disease of cattle, causes deaths, abortions, and weight loss estimated to cost the U.S. cattle industry more than $100 million per year. ARS researchers at Pullman, Washington, along with co-workers at Washington State University and the University of Florida, have developed a DNA probe that is revolutionizing anaplasmosis investigations. Until the development of the probe, there was no convenient and economical means to identify chronic carrier cattle and infected ticks. Where anaplasmosis has been established in a herd, the probe is 50-90 percent more effective in identifying carriers than conventional tests. Furthermore, the probe will detect anaplasma in cattle before they are sick and before the organisms appear in blood smears.

Gel diet improves efficiency of screwworm eradication. The screwworm, a parasitic fly that attacks livestock, caused over $357 million per year in losses to U.S. animal agriculture before it was eradicated from the United States and Mexico through an APHIS program using the sterile male technique. ARS scientists in Tuxtla Gutierrez, Mexico, have developed a new gel diet for artificially rearing screwworms that will make the sterile male program even more efficient and conserve APHIS resources for other activities. Consisting of a gelling agent, known as Water-lock G-400, and other nutrient components, this diet represents a new dimension in screwworm production technology. The principal advantages of the new diet are: substantial savings in cost; reduced labor and easier maintenance; improved sanitation; more uniform and competitive sterile screwworms; and reduced environmental contamination from waste products.

Subpopulations of white blood cells discovered. Mastitis is a disease of the udder that causes major economic losses ($2 billion annually) to the dairy industry. Scientists in the Milk Secretion and Mastitis Laboratory, Beltsville, Maryland, discovered that individual cows' white blood cells (neutrophils) differ in their ability to move from blood to the site of a bacterial infection and differ in their ability to ingest and kill bacteria. Monoclonal antibodies were developed which recognize four distinct subpopulations of white blood cells based on cell surface antigenic determinants. This discovery demonstrates subpopulations which differ functionally and may prove to be an important genetic marker for selection of disease-resistant animals.

Compound protects against fescue toxicosis. Feed costs often exceed 50 percent of the total cost of animal production. Tall fescue is an important cool-season grass grown on over 35 million acres in the United States. Most of the plants are infected with an internal fungus. Cattle frequently become ill when they graze infected fescue. Production losses of $1 billion a year from poor gains and reduced reproductive efficiency have been projected. Research demonstrated efficacy of animal treatment with a dopamine antagonist to overcome effects of toxic fescue. The compound improved steer gain by over 100 percent with greater improvement at the higher fungus level. Use of this compound prevents production losses of animals on toxic fescue without costly pasture renovation. The use of this compound against fescue toxicosis is covered by a patent shared by ARS scientists at Watkinsville, Georgia, and with scientists at the University of Georgia, Athens, Georgia.

DNA probe developed for deadly bacterium in catfish. *Edwardsiella ictaluri*, a mud-dwelling bacterium, is suspected of causing up to 40 percent of all catfish diseases in the southeastern United States. The catfish death toll in an *Edwardsiella*-infected pond can hit 50 percent. Fish farmers traditionally have fought back by using feed dosed with antibiotics. However, medicating feed is expensive and farmers have had no way of determining whether their fish were really at risk until the fish began dying and the bacterium was found in their bodies. ARS scientists at Auburn, Alabama, have found that a protein from the bacterium can be mixed with blood from a representative sample of fish to determine if a pond's fish are truly infected. The protein may be ready for use in a commercial diagnostic test evaluation as early as 1990 and might someday form the basis for a vaccine to protect catfish against *Edwardsiella ictaluri* attacks.

RESEARCH ON COMMODITY CONVERSION AND DELIVERY

Current Activities: The food safety needs of consumers and the markets for U.S. exports are key factors in determining postharvest research strategies. In meeting these needs, ARS research expands knowledge of inherent characteristics (physical, chemical, and biological) of food, feed, fiber and industrial products. This research is important to reduction of commodity and product losses due to postharvest pests, and is critical to product safety, quality and value. The research utilizes biotechnological tools and the expanding knowledge base to respond to unique market opportunities with new products and processes. Innovative, quality products of higher value which can be rapidly delivered are being emphasized. It is important that products be benign to the environment and have sound commercial potential, such as biopesticides and biodegradable plastics. Since improved product durability is a concern; research to increase product shelf-life and thus expand U.S. exports is under way. Substitutes which can be derived from U.S. agricultural surpluses are being developed for imported commodities.

Selected examples of recent progress:

Nonhazardous solvent for extraction of pesticide residues. Extraction of chlorinated pesticide residues from poultry tissue has commonly required the use of hazardous organic solvents. These solvents may be replaced by carbon dioxide under high pressure. ARS scientists at Peoria, Illinois, have shown that carbon dioxide under high pressure is also an effective solvent in the subsequent quantitative chromatographic analysis of the extracted toxicants. Extraction and analysis procedures using high pressure carbon dioxide as a solvent will provide the means to produce safer food products by analyzing a greater number of meat samples. This will benefit the Food Safety and Inspection Service and consumers by protecting both the analyst and the environment and effectively removing pesticide contaminants from food.

Mathematical models help control Listeria. Listeria monocytogenes is a pathogenic bacteria that can result in food poisoning. Such factors as storage temperature, initial pH (acidity), salt content, sodium nitrite (curing salt) concentration, and atmosphere (with and without oxygen) all interact to either enhance or prevent the growth of the bacteria. Mathematical models based on the effects of these factors were developed at the Eastern Regional Research Center in Philadelphia to predict how Listeria will grow in response to any combination of the variables within specified ranges. The models provide food manufacturers and regulatory officials in the Food Safety and Inspection Service with a rapid means of estimating the growth of the bacterium in specific food systems.

Enzyme cloned for toxic tricothecene. Under the right environmental conditions, corn may be infested with many fungi, some of which produce tricothecenes which are toxic to both humans and animals. The gene for the enzyme, trichodiene synthase, the first enzyme in the trichothecene biosynthetic pathway, has been sequenced, cloned, and characterized, and useful gene transformation systems have been developed at the Northern Regional Research Center in Peoria, Illinois. A series of oxygenated trichothecenes have been isolated from fermentations to help determine intermediate metabolites in the biosynthetic pathway of trichothecenes. The knowledge of these enzyme pathways will lead to control of trichothecene formation in *Fusarium* infection of corn plants, thus resulting in safer food.

Cell culture as a means to produce taxol. The expanded use of taxol in cancer chemotherapy clinical trials is limited by the scarce supply of the drug. The *Taxus brevifolia* tree, used as raw material, is both uncultivated and slow growing. Since organic synthesis of taxol is not yet possible due to its complex structure, a system to grow plant cells in culture to produce taxol would have commercial potential. At the Southern Regional Research Center, New Orleans, a novel method has been developed for growing viable *Taxus* cells in culture for prolonged periods. Using this system it has been shown that taxol can be produced. The National Cancer Institute has responded very positively to the results. Moreover, a Cooperative Research and Development Agreement is being established between ARS and a pharmaceutical company to develop the technology.

A new method developed to determine if fuller rose beetle eggs are dead or alive will avoid costly delays and loss of shelf-life of citrus at port of entry in Japan. Fuller rose beetle is a pest of citrus that lays egg masses in crevices and under the calyx ("button") of citrus fruit. Exported citrus with live beetle egg masses are not allowed into Japan. When egg masses are found by Japanese inspectors, they determine if the eggs are viable or dead by incubation at 27°C and 85% relative humidity. The citrus shipment is held in quarantine until egg hatch data shows (1) the citrus can be released (all eggs are dead); or (2) the shipment must be returned, be destroyed, or fumigated (because some eggs are viable). Fumigation damages the fruit. To expedite the detection of viable eggs, ARS scientists at Fresno, California used a modified bioluminescent (light emitting) assay to detect adenosine triphosphate (ATP). The ATP method offers a quick and sensitive screen for determining live Fuller rose beetle eggs on citrus for export.

Shrink wrap improves quality of tangelos. "Minneola" tangelos are a specialty fruit which have a short postharvest shelf life, usually no more than 2 weeks, which severely limits their competition in the domestic marketplace. Symptoms of senescence such as necrotic peel tissue, pulp softening and deterioration of flavor develop relatively quickly and are highly objectionable to consumers. Researchers at the U.S. Horticultural Research Lab in Orlando, Florida found that wrapping "Minneola" tangelos in permeable plastic film drastically reduces or eliminates deterioration of peel tissue, slows the rate of fruit softening, and maintains a more acceptable juice flavor compared to waxed fruit in normal refrigerated storage. This system will be beneficial to the domestic marketing of these fruit, especially in the gift-pack trade which is a highly profitable alternative market outlet for the fresh citrus industry.

New compound found beneficial for retaining meat flavor. Retention of desirable meat flavor and prevention of flavor deterioration in cooked meats is of significant economic importance to the use of meat products in the institutional and convenience food markets. A compound called chitosan made from chitin, a substance found in crab and shrimp shells, was shown by researchers at the Southern Regional Research Center, New Orleans, LA, to be an excellent scavenger for trace metal ions which contribute to lipid oxidation and loss of flavor. Taste panel evaluation confirmed that meats treated with chitosan retained more desirable flavor qualities than untreated meats. A patent for use of the compound as a food additive has been issued and elicited more than 100 industrial inquiries about licensing. FDA clearance as a food additive will be required.

Comparative evaluation of soybean, sunflower, and rapeseed oil quality. Stability to oxidation induced by light or autoxidation in air is key to acceptable performance of an edible vegetable oil, particularly in terms of flavor. Both the functional quality and nutritional quality of the oil are affected by the fatty-acid composition. The flavor and oxidative stability of these oils, which differ in the relative proportion of oleic, linoleic, and linolenic fatty acids, were evaluated at the Northern Regional Research Center, Peoria, Illinois, in the presence and absence of light and citric acid (antioxidant) at room and elevated temperatures. Chemical and taste panel evaluations confirm that soybean oil, under dark storage, was more stable than either of the other two oils under all other conditions. In the presence of light, sunflower oil was more stable than soybean oil in the presence or absence of citric acid. In the absence of the antioxidant, the order of decreasing light stability was sunflower, soybean, and rapeseed. These data will serve as a guide to the food industry in providing the consumer with optimum quality and performance.

Objective evaluation of U.S. wheat hardness. Hardness, a characteristic used in classifying wheat, is indicative of end-use quality. Currently hard and soft wheats are classified by the visual characteristics of the wheat kernel and not by any assessment of physical properties. Since many newly released varieties do not have the traditional visual characteristics of their class, development of an objective means for evaluation of kernel hardness has become essential to orderly marketing, export, and grading of wheat by the Federal Grain Inspection Service (FGIS). ARS scientists at Beltsville, Maryland, utilizing the relationship between the scatter properties of light and particle size distribution, defined hardness in terms of the near-infrared spectroscopy response obtained with a ground wheat sample. Hardness scores were determined by the approved method for about 1900 wheat samples collected in 1988, representing more than 125 varieties and 10 states. A wide range in hardness values within and among varieties was found. This compilation of values, published as an ARS bulletin, provides first objective evaluation of wheat hardness nationwide, and forms an initial database to help understand the effects of variety, growing conditions, and environment. Availability of the hardness value from FGIS as an information factor in wheat grading is anticipated in 1990.

Polycarboxylic acids can replace formaldehyde resins in durable press processing of cotton. The Occupational Safety and Health Administration has regulated formaldehyde in the work place, and has revised permissible level downward several times. This new finishing process was discovered three years ago at the Southern Regional Research Center in New Orleans, Louisiana, with the potential to eliminate formaldehyde-based resins. However, commercial interest was doubtful, because of certain chemical and up-scaling problems. Cooperative work with a number of textile and chemical companies has now proven commercial interest. Thirteen companies have applied to license the invention. One is already in commercial production. The new process should begin to displace formaldehyde-based resins by late 1990, and may replace these resins entirely in 4-5 years.

New seed-cotton cleaner improves quality of stripper-harvested cotton. Harvesting cotton by the stripper method costs less, by several cents per pound, than the more common spindle harvesting method. However, burs and major plant parts are trapped in the cotton lint, and special machines are used to remove much of this material from the seed cotton. An improved machine has now been developed by the Cotton Production and Processing Laboratory at Lubbock, Texas, which is substantially more efficient than the existing machinery. The new machine, called the Multistage Extractor, reduces trash content in seed cotton to one-half of that cleaned by conventional cleaners, and results in much cleaner fiber in the bale. This improved process will improve lint grade and bale value for the farmer, and lower trash levels for spinners of cotton. A full-sized prototype is being evaluated in a commercial gin in the 1989-90 ginning season, in cooperation with one of the major gin-machine manufacturers.

Computerized process control system improves cotton quality. Enhancement of cotton quality is hampered by the variability of the trash level and moisture content before processing at the gin; essentially all cotton is cleaned with the same machinery. This procedure degrades fiber quality and does not produce optimal monetary return to the farmer. To solve this problem, a computerized process control system was developed by the Cotton Ginning Laboratory in Stoneville, Mississippi, that measures fiber moisture and trash content before, during and after gin cleaning and drying, controls the flow of cotton through the optimal equipment sequence, and can increase farmer profits up to $40 per bale. The system has been installed in a small-scale gin and field tests in a commercial gin are underway.

RESEARCH ON HUMAN NUTRITION

Current Activities: ARS research findings on human nutrition requirements, food composition and bioavailability of nutrients, and nutritional status assessment have greatly enhanced USDA's ability to detect and solve national nutrition problems linked to the food supply. Research emphasis is placed on determining the special dietary needs of infants, young children, and the elderly; and on promoting better health by reducing risk factors associated with obesity and other diet-related disorders. Special attention is given to coordination of research activities with other agencies.

Selected examples of recent progress:

Estimated protein requirements of lactating women may be low. A 12 month study of lactation of healthy women at the ARS Childrens Nutrition Research Center at Baylor College of Medicine, Houston, Texas revealed that both the quantity of milk produced and the concentration of protein in the milk were influenced by the mother's dietary protein and energy intake, as well as their body protein metabolism. The amount of dietary protein intake recommended for lactating women by most health and scientific organizations is one gram of protein per kilogram of body weight daily. This estimate was tested for adequacy using the nitrogen balance method. Lactating women, consuming this amount of protein, despite higher energy intakes, had lower nitrogen balances than non-lactating control women. This finding suggests that the current recommended dietary allowance for protein may be insufficient to fully meet the needs of well-nourished lactating women.

Fatty acids in breast-milk influenced by diet. Variations in the fat composition and intake of a mother's diet alter the fat composition of her milk. Triglycerides are the major components of human milk fat and are derived from three sources: mammary gland production, dietary fats, and body fat stores. At the ARS Childrens Nutrition Research Center at Baylor College of Medicine, Houston, Texas, a method was devised, which utilizes stable isotopic labeling to trace the effect of dietary fat on fat production by the mammary gland and attendant changes in milk fat composition. Low-fat diets resulted in milk that contained more medium-chain triglycerides. The primary fatty acids synthesized during lactation were saturated fatty acids with 10, 12, and 14 carbons in length. Diet had no major influence on milk fat level. These findings are important in defining the factors which influence the fatty acid content of breast milk.

Boron depletion increases bone mineral loss in humans. Osteoporosis is a disorder of older people which is characterized by the loss of bone calcium and increased chances of bone fractures. About 15 to 20 million persons are affected in the United States, with approximately 1.3 million fractures annually in people aged 45 years and older. A study performed at the ARS Human Nutrition Research Center, Grand Forks, North Dakota, on 15 postmenopausal women and older men confirmed previous findings that a dietary lack of the mineral boron increased the urinary loss of bone minerals. Thus, boron appears to influence calcium metabolism. Eating diets rich in fruits, vegetables, legumes, and nuts, which contain high amounts of boron, may help prevent osteoporosis.

Copper requirements in adults. Copper requirements and methods for assessing copper status in humans are poorly understood. Hence, at the ARS Human Nutrition Research Center, Grand Forks, North Dakota, indices of copper status were measured in eight men and eight women fed diets low in copper for periods ranging from 42 to 120 days. Three of the men and women fed 0.9 mg Cu per day showed signs of copper depletion, including increased serum cholesterol, lower glucose tolerance, and blood pressure changes while one man had significant changes in plasma copper and a copper dependent enzyme. The findings suggest that the human copper requirement is probably slightly above 0.90 mg per day and that sex differences exist in indices of copper status. These observations are useful for defining copper requirements and methods for evaluating copper nutrition in population surveys.

Nutritional status influences cataract formation. Elevated levels of dietary vitamin C, an antioxidant, have been found to increase the protection of guinea pig eye lens from ultraviolet light and thereby delay cataract formation. Because of this finding at the ARS Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts, blood levels of several nutrients were measured in aging individuals with cataracts and matched controls without signs of cataracts. Blood levels of vitamin C and carotene were found to be significantly higher in those persons without cataracts. The findings are consistent with the hypothesis that cataract formation may be delayed by nutrients that inhibit oxygen and accelerated by those that influence the activation of oxygen.

Vitamin D needs of aging women increase in winter. Studies in aging women indicate that the recommended dietary allowance for vitamin D is too low. Higher intakes were found to be needed in the elderly during winter months to prevent an increased production of a parathyroid hormone which enhances bone resorption and loss of bone calcium. A 10 percent increase in the allowance was found to be sufficient for healthy ambulatory postmenopausal women in a study conducted at the ARS Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts.

Vitamin E improves immune response of elderly. Older people generally have a diminished immune response leading to more infections as they age.

Results with animals at the ARS Human Nutrition Research Center on Aging at Tufts University, Boston, Massachusetts, indicated that higher intakes of vitamin E improved immune response. Therefore, the effect of daily vitamin E supplementation on several indicators of immune response was measured in 32 healthy subjects over 60 years of age. The results confirm the earlier observation with aged animals, as several parameters of immune response were improved. The findings suggest that vitamin E supplementation may improve immune responsiveness in healthy elderly.

Zinc involved in temperature regulation. Recent observations suggest that zinc deficiency might affect energy metabolism. Therefore, a study was conducted at the ARS Human Nutrition Research Center, Grand Forks, North Dakota, to determine the effect of zinc nutritional status on regulation of body temperature in the cold. The zinc-deficient animals were unable to increase or to maintain their internal body temperature in contrast to animals receiving adequate zinc or restricted energy intake. Thyroid hormones in the blood, the major mechanism for increasing body heat production, were lower in the zinc-deficient animals. Thus, zinc-deficiency appears to thereby reduce the capacity of the body to produce heat and maintain body temperature.

Lowering dietary risk factors for coronary heart disease. Coronary heart disease (CHD) though declining in the U.S., still is the most common cause of death, with over 1.25 million heart attacks annually. Dietary risk factors have been identified which relate to the high incidence of this condition. In adult males, low fat diets containing lean meats trimmed of separable fat and low-fat milk did not increase the risk factors associated with CHD. Increasing the dietary polyunsaturated fatty acid (linoleic) in place of saturated fatty acids, with total dietary fat kept constant, resulted in more desirable blood clotting times in males. These results obtained at the ARS Western Human Nutrition Research Center, San Francisco, California, indicate that lean meat and low fat milk do not increase risk of heart disease and that increasing the amount of polyunsaturated fatty acids in the diet may decrease the risk for stroke.

Improved method for dietary fiber. A modification of the enzymatic-gravimetric method adopted by the American Association of Analytical Chemists for total dietary fiber has been devised at the ARS Human Nutrition Research Center, Beltsville, Maryland. This method is less labor intensive and less costly. Comparison of the two methods revealed similar results for a wide variety of foods. The modified method eliminates several steps without adversly affecting its accuracy. With further modifications soluble and insoluble dietary fiber components can be quantitated. This improved method will aid in assaying for dietary fibers in foods.

Exercise and aging. Increased physical activity in the elderly has been shown to increase life expectancy even into advanced old age. Normal age-related changes in body composition, including increased fat mass and decreased muscle and bone mass, appears to be due largely to decreasing physical activity. These changes are associated with a greatly increased risk for developing mature-onset diabetes. Research showed that 12 weeks of strength training, 3 days per week, by adults 60-72 years resulted in a marked increase in strength and an 11 percent increase in the total muscle size of the thigh. Regular aerobic conditioning 4 days per week also causes significant improvement in exercise performance of 90 year-old subjects. These studies conducted at the ARS Human Nutrition Research Center on Aging, Boston, Massachusetts, indicate that the capacity of skeletal muscle to adapt to an exercise intervention is preserved well into old age.

INTEGRATION OF AGRICULTURAL SYSTEMS

Current Activities: The solution of important national problems faced by agriculture requires the integration of components of research from all areas of the agricultural and natural resource system. These include soils, plants, insects, diseases, livestock, and people. A primary objective of systems research is to package research results into products that aid or improve the timeliness and accuracy of decisions made by managers of agricultural systems. Systems research can result in lower input costs, better quality products, more efficient resource use, reduced environmental impact, and improved sustainability of agricultural production systems to meet long-term needs.

Systems research teams are typically composed of scientists and engineers from several disciplines who are stationed at more than one location. Team members are linked together through national information networks to share concepts and data bases required to build systems models. Models serve as surrogates for the real system on which experiments can be performed to estimate the system's response over time to alternative environments or management practices. It is usually not possible to perform such experiments on the real system because it is too costly, or requires too much time to obtain the results. The accuracy with which the models represent the real systems is tested through validation experiments. Validated models serve as predictors of system performance, and can therefore be used in the decision making process as a tool to estimate how the system can best be managed to achieve desired ends.

Selected examples of recent progress:

Bioeconomic model reduced herbicide use. Farmers could save up to $25 per acre in herbicide costs if they could anticipate the potential crop loss from weeds. Fifteen Colorado corn farmers are testing a computer model developed by ARS scientists in cooperation with Colorado State University. A rule long used in insect control--don't spray unless pest counts indicate yield loss will be great enough to justify the expense--has been adapted where farmers can enter weed seed numbers in their soil into a computer using software that performs the financial calculations. The Corn/Weed Bioeconomic Model forecasts crop losses, in dollars, based on weed seed numbers, the price of herbicides, the probable sale price of corn with the model's estimated yield. The scientists plan to refine this model to handle crop rotations that include corn, pinto beans, barley and sugar beets. In addition, it will be adapted to the Midwestern States in order to prevent groundwater pollution.

Satellite imagery for crop inventories. Assessing the stage of growth and relative crop health over large areas using ground survey techniques is time consuming and costly. A cooperative research program involving ARS scientists at Weslaco, Texas, and university scientists has discovered that SPOT (French satellite system for observation of the earth) satellite imagery, with a resolution of 20 m, can be used for monitoring crop management practices in the Rio Grande Valley to control cotton pink bollworm and boll weevil. Proper cotton stalk destruction after harvesting can effectively contol these pests without chemicals, saving an estimated $15 million in chemical costs for the Rio Grande Valley alone. Not only did the SPOT imagery provide information to monitor cotton plow down, but can be used to inventory sugarcane, cotton, sorghum, vegetables and citrus, as well as mapping saline soil and cotton root rot problems.

Computer program eliminates guesswork in irrigating peanuts. Peanut farmers are facing high production costs, increased risk because of extensive use of pesticides, and tremendous losses to soilborne pests and irrigation and pest control have become very complex. Scientists at Dawson, Georgia, have developed a computer program known as the Peanut Expert System (PEANUT). Using PEANUT, production decisions can be made that are based on research findings rather than relying solely on the farmer's intuition. PEANUT can be used on a farmers personal computer to lead the user through a planned strategy of irrigation and pest control. Some of the expected benefits are a reduction in the amount of chemicals applied to control peanut pests in diseases that normally occur when a field is over irrigated. A third to half of the 20-25 inches of water needed to produce a peanut crop comes from irrigation. The program should cut total water use to 16 to 20 inches per crop-year. At the same time, the program should reduce chemical use by 10 to 30 percent. The average grower should see yields increase by 300 to 400 pounds per acre a year. Moreover, a higher quality crop could improve profits by about $30 per ton.

Stochastic weather generator for mountainous areas developed. Simulation of mountainous rangeland systems has been difficult because of the lack of a weather generator that reflected the peculiar characteristics and seasonal patterns found there. Precipitation in mountainous areas often comes in the form of snow which adds to the complexity of the problem. ARS scientists at Boise, Idaho, developed a stochastic weather model for mountainous areas. They demonstrated that the resulting simulated weather records could be used to effectively validate rangeland models such as SPUR, ERHYM, SWRRB, and WEPP in simulating runoff, erosion, and soil water dynamics on mountain rangeland watersheds. They also demonstrated the need for an improved understanding of the movement of water through frozen soils.

Photosynthesis model includes direct effect of carbon dioxide changes. There is currently much interest in global change and the ways in which man's activities may be changing the earth's environment. Models have been used extensively to evaluate the potential impact of the global change on agricultural productivity.

With few exceptions, these models do not take into account carbon dioxide concentration. A model has been constructed by ARS scientists at Beltsville, Maryland, that calculated canopy photosynthesis as a function of carbon dioxide and other important environmental variables. The photosynthesis model is being incorporated into crop models to give more realistic predictions of crop response to future environmental conditions. The model indicates that an increase of carbon dioxide by 50 percent would increase crop production by 15 percent where no other factor is limiting.

AGRICULTURAL RESEARCH SERVICE

Buildings and Facilities:

For acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities as necessary to carry out the agricultural research programs of the Department of Agriculture, where not otherwise provided, [$10,675,000] $32,600,000: Provided, That facilities to house Bonsai collections at the National Arboretum may be constructed with funds accepted under the provisions of Public Law 94-129 (20 U.S.C. 195) and the limitation on construction contained in the Act of August 24, 1912 (40 U.S.C. 68) shall not apply to the construction of such facilities: Provided further, That funds recovered in satisfaction of judgment at the Plum Island Animal Disease Center shall be available and augment funds appropriated in a prior fiscal year for construction at Plum Island Animal Disease Center and be used for construction necessary to consolidate research and operations at the Center and for renovation of the Beltsville Agricultural Research Center.

AGRICULTURAL RESEARCH SERVICE

BUILDINGS AND FACILITIES

Appropriation Act, 1990	$10,675,000
Budget Estimate, 1991	32,600,000
Increase in appropriation	+21,925,000

SUMMARY OF INCREASES AND DECREASES
(on basis of appropriation)

Items of Change	1990 Estimated	Program Changes	1991 Estimated
U.S. Salinity Laboratory, Riverside, California	$2,000,000	-$2,000,000	--
National Seed Storage Laboratory, Fort Collins, Colorado	5,500,000	-1,500,000	$4,000,000
South Central Agricultural Research Center, Lane, Oklahoma	150,000	-150,000	--
U.S. Fruit & Vegetable Laboratory, Yakima, Washington	1,000,000	+9,100,000	10,100,000
Northwest Small Fruit Center Washington, Oregon and Idaho	50,000	-50,000	--
U. S. Vegetable Laboratory Charleston, South Carolina	1,135,000	-1,135,000	--
ARS Bee Laboratory Weslaco, Texas	340,000	-340,000	--
Plant Stress and Water Conservation Laboratory, Lubbock, Texas	500,000	-500,000	--
Modernization of Facilities, ARS Beltsville Agricultural Research Center, Beltsville, Maryland	--	+16,000,000	16,000,000
Poultry Disease Laboratory, Athens, Georgia	--	+2,500,000	2,500,000
TOTAL, Available	10,675,000	+21,925,000	32,600,000

Project Statement
(on basis of appropriation)

	1989 Actual		1990 Estimated			1991 Estimated	
Project	Amount	Staff Years	Amount	Staff Years	Increase	Amount	Staff Years
Buildings and Facilities...	$7,012,303	--	$10,675,000	--	+$21,925,000	$32,600,000	--
Unobligated Balance......	23,530,573	--	--	--	--	--	--
Total Available: or estimate..	30,542,876	--	10,675,000	--	21,925,000(1)	32,600,000	--

JUSTIFICATION OF INCREASES AND DECREASES

(1) A net increase of $21,925,000 for Buildings and Facilities consisting of:

(a) A decrease of $10,675,000 to delete funds contained in the FY 1990 Appropriations Act for planning and construction projects.

Need for Change. Funds for projects contained in the FY 1990 Appropriations Act are available until fully expended and are not required in the FY 1991 Appropriations Act.

(b) An increase of $4,000,000 for construction of a new National Seed Storage Laboratory, Fort Collins, Colorado.

Need for Change. Design for a new National Seed Storage Laboratory is nearly complete and construction has been partially funded. The project is large and somewhat complex and cannot be efficiently completed as two separate projects. Federal procurement authorities and regulations do not permit initiation of this project without availability of all funds required to complete the project.
The present National Seed Storage Laboratory (NSSL) was constructed in 1957. While the National Plant Germplasm System (NPGS) includes numerous smaller working collections, the NSSL is the most important germplasm repository. It houses the base collection of seed.

As the first facility in the world designated for the long-term preservation of plant germplasm, the planners had little experience to draw upon. A facility that was planned to accommodate 50 years of growth in acquisition of germplasm stocks will soon be entirely filled. Also, in 1957, it was believed that a storage environment of 40 degrees Fahrenheit and 40-50 percent relative humidity would assure the seed viability for 50 or more years. From experience and research, we now know more precise temperature and humidity conditions are required.

By the end of the 1950's, biologists were beginning to recognize that valuable crop germplasm was being lost because of man's activities. For this endangered germplasm to be available to future generations, its collection and preservation had to be accelerated. Collection was accelerated and is far from being finished for most of our food, fiber, and forage crops. There are now about 210,000 seed samples (accessions) in the NSSL. Plans now being developed for further acceleration of collection of endangered germplasm, especially of wheat, corn, soybeans, and forage crops, will dictate the need for expanded storage facilities.

Nature of Change. Construction will include the expansion and renovation of the present NSSL facility at Fort Collins, Colorado. The proposed increase of $4,000,000 is needed to initiate and complete construction of this facility. To date, Congress has provided $1 million for planning and $8,250,000 for construction of this project. The feasibility of initiating construction, before full funding has been provided, is not cost-effective. No construction can be started until the entire package is fully funded.

(c) An increase of $16,000,000 for modernization of facilities at the Beltsville Agricultural Research Center, Beltsville, Maryland.

Need for Change. The Beltsville Agricultural Research Center (BARC) was established in 1910. Current land resources total 7,000 acres and accommodate more than 800 buildings and structures in support of the full spectrum of ARS research programs; natural resources, plant science, animal science, product quality, and human nutrition. The ARS staff totals about 1,500 including 440 scientists.

BARC is the largest research center in ARS and in fact is regarded as the largest agricultural research center in the world, in terms of program scope and concentration of scientists. BARC has long enjoyed a worldwide image of preeminence in the agricultural sciences because of its history of research quality, contributions to agriculture, prominent scientists, and site of ARS' national leadership. In addition to ARS, 18 other Federal and State agencies are co-located on or immediately adjacent to BARC.

Most of the major ARS facilities and utility support systems at BARC were constructed in the 1930's and 1940's. Acute deterioration and obsolescence of these 50-year old facilities are severely hampering the quality of science and the image of BARC as the preeminent agricultural research center.

A BARC modernization initiative -- called Renaissance 93 -- was launched in 1985. This initiative highlighted the need for major modernization of BARC. Currently underway at BARC is a consultant study to develop an overall master plan and cost estimate for the facility modernization work remaining. In addition to BARC proper, the modernization concept also applies to the U.S. National Arboretum which is organizationally a part of the Beltsville Area of ARS. The study will be final in March 1990 but certain recommendations have been clearly identified:

- top priority should be given to upgrading/replacing infrastructure sewer, water, power, steam, roads;
- some new or replacement facility construction will be more cost effective than repair/renovation/refurbishing of old, existing buildings alone;
- some BARC research programs and organizational units need to be clustered in new configurations;
- BARC needs centralized services and facilities such as biological containment, conference center, food service, analytical instrumentation, animal rooms, inciters, photographic services, etc.;
- BARC needs one or more major new facilities to accommodate effective program clustering, modernization sequencing, and centralized services;
- BARC security systems are totally inadequate, in some cases nonexistent. It is essential that improved security capabilities be incorporated into modernization plans;
- BARC greenhouses and growth chambers are more than adequate in terms of available space but far below state-of-the-art in environmental controls and energy/cost effectiveness. A near total renovation or replacement is needed.

The findings identified above and other recommendations are already shaping FY 1990 and FY 1991 planning, primarily with regard to a redirection of some modernization resources from lesser priority projects to the infrastructure. Also, a major policy impact from the early findings is the necessity to look upon BARC modernization as requiring a mix of new and renovation construction. This is a major factor in requiring appropriation of funds through the buildings and facilities account.

Nature of Change. In FY 1990, funding for the modernization of the Beltsville Agricultural Research Center (BARC) in the amount of $7,550,000 was appropriated under the ARS Salaries and Expenses appropriation. The FY 1991 Budget requests a decrease of $7,550,000 in the Salaries and Expenses appropriation and a concurrent increase of $16,000,000 under the Buildings and Facilities appropriation. These actions will provide the necessary authority for effective management and implementation of BARC construction, repair, renovation and modernization needs.

In FY 1991 the requested increase of $16 million will be used to finance the following building renovations, new construction and utility facilities upgrade. More specifically, the following projects will be undertaken with the proposed increase:

Major High-Priority Initiatives:

o Study and design of new Plant Science Laboratory, BARC-West.

Funds will be implemented for study and design of a new Plant Science Facility at BARC-West. This facility will bring together 55 scientists in a united cluster to advance high priority plant research. Currently these scientists are housed in antiquated facilities (Buildings 1 and 4 and in headhouses located in Range 1 and 2 -- Buildings 9, 10, and 11). The laboratories are not functional given their present conditions. Modern facilities are needed in order to advance high priority research: develop improved pest resistant, high quality germplasm and varieties of major vegetables and fruit crops; reduce costs of soybean production and improve quality of soybean products; solve problems of plant growth and flowering, genetic improvement; and the production and maintenance of pathogen- and pest-free plants; develop efficient and cost effective means of biocontrol of plant diseases; and solve agricultural problems arising from plant diseases from lack of efficient associations between plants and beneficial microbes. These programs which are widely dispersed in different buildings will be brought together in a new facility consisting of 68,000 square feet of modern laboratory space.

o Modernization of Range 2 Greenhouses.

Range 2 of the greenhouse complex at Beltsville is over 45 years old. It is used to support a wide range of research programs, including the development of new florist and nursery crops to make American producers more competitive with foreign imports into the U.S. markets; to find new methods for developing disease resistant plants, especially horticultural crops such as tomatoes, beans, and small fruit; and for breeding plants with improved nutritional quality and longer storage life. Most of the existing greenhouses have outlived their normal useful life expectancy, are inefficient and costly to heat, and in constant need of repair. These greenhouses must be systematically modernized to reduce operating costs and provide the proper environment for containment along with more modern temperature and humidity control systems.

The modernization plan for Range 2 will be carried out in four phases. Phase 1 construction is planned for 1991. Additional phases are projected for 1992, 1993, and 1994 with construction to be completed by the end of 1995.

- Design for new Integrated Swine Facility.

Currently swine research facilities are dispersed over three separate locations at Beltsville. These facilities are 50-60 years old and antiquated beyond consideration for total rehabilitation. To improve labor efficiency, enhance security, and improve the reliability of the research findings, it is essential to consolidate and modernize the swine research facilities at Beltsville. A single, centralized complex is envisioned that would support research on swine nutrition, reproductive physiology, parasitic diseases, and improved meat quality, especially consumer products with less fat and a higher proportion of lean tissues. The complex would be a general purpose structure for housing gestating animals and growing swine, an animal surgery area, and an intensive animal monitoring/metabolism area equipped with environmentally controlled rooms and respiration calorimeters. The facility would be approximately 50,000 square feet in size.

Other High Priority Needs:

- BARC waste water treatment facilities--two plants (one design; one construction).
- Modernization of BARC electrical distribution system (construction).
- Modernization of Building 001--laboratory/offices (design).
- Repair of service building 029 (design/construction).
- Replacement of HVAC system--Building 050 (construction).
- Repairs to poultry house HVAC (design/construction).
- Annual painting and roof repairs to BARC facilities.
- Granary improvements (design/construction).
- Central collections facility (study).
- Rebuild free stall barn (study/design).
- Demolition of old, unused facilities.
- Repair and maintenance of miscellaneous BARC projects.

The proposed projects are consistent with the recommendations of the study and overall research program priorities.

(d) An increase of $10,100,000 for construction of the Yakima Agricultural Research and Vegetable Laboratory, Yakima, Washington.

Need for Change. The Yakima Agricultural Research Laboratory conducts research on the biology, ecology, and control of insect and mite pests of deciduous fruits, vegetables, and field crops. The current laboratory facilities are leased and are located on approximately 9 acres of land within the city limits of Yakima. Urban development has encroached to the point that it is extremely difficult to conduct normal research activities. In addition, there has been a need to provide temporary ARS buildings and research facilities and 37 separate buildings now occupy the 9-acre site. There is inadequate space for orchards and research plots. There is a pressing need to relocate this research laboratory as the present lease expires in 1991 and there is no assurance that the lease will be extended.

To date, Congress has provided $1 million for planning and design of a new research facility at Yakima and $1.9 million for construction. ARS representatives have worked closely with industry representatives to find a suitable site for the proposed new facility. The industry site committee has now located a 55-acre site outside the city limits and they have taken an option on the land. The industry plans to buy the land, lease it to ARS until the cost of purchase is recovered, and then deed it to the Department.

The A-E contract award will be made during the second quarter of FY 1990. Design is scheduled to be complete the second quarter of FY 1991.

Nature of Change. The proposed increase of $10,100,000 is needed to initiate and complete construction of this facility. No construction can begin until the entire package is fully funded. The new facility, when completed, will provide approximately 50,000 square feet of laboratory space and 18,000 square feet of greenhouses.

(e) An increase of $2,500,000 for planning, design, and construction of a Poultry Disease Laboratory, Athens, Georgia.

Need for Change. The Southeast Poultry Laboratory houses the USDA's primary effort for research on avian disease problems associated with pathogens of foreign origin. The Athens laboratory researches critical poultry disease problems of national concern: salmonellosis in poultry; prevention and control of newcastle disease in commercial poultry; development of diagnostic tests for avian influenza and exotic newcastle disease; molecular biology and control of avian influenza; etc.

New demands have been placed on USDA research facilities at the Southeast Poultry Research Laboratory since the avian influenza outbreak which occurred in 1983 and 1984 in Pennsylvania, Virginia, and Maryland. The addition of this facility will provide high containment needs to house research on highly lethal avian influenza.

This new facility will provide both immediate and future long-range needs to allow ARS scientists to address the urgent problems in highly contagious and lethal avian influenza and exotic newcastle disease research. This facility will support the research needs of action agencies (APHIS and FSIS) and the poultry industry. The facility is of national priority and interest because research on these two exotic avian diseases is restricted to only the highest animal containment laboratories.

The increase will provide for an additional animal laboratory wing designed primarily to house infected poultry as well as the necessary support laboratories to carry out essential research on avian influenza, concurrent with exotic newcastle disease research efforts in the present containment space. This facility will provide for a more complete program of poultry research to solve these exotic diseases.

Nature of Change. The new facility will provide approximately 10,000 square feet and will contain animal holding and laboratory spaces designed to safely contain the most hazardous of poultry pathogens.

The proposed addition represents the most cost-effective and program-effective means to carry out a vital, national poultry disease research mission. Estimated cost of construction is $2.5 million. The poultry industry supports the high priority of this new facility and has pledged substantial funding towards the structure.

Agricultural Research Service
Status of Construction Projects as of December 1989

Status of research facilities authorized or funded in prior years and reported as uncompleted in the 1990 Explanatory Notes, is as follows:

NOTE: Design criteria, provided by ARS, specifies the program requirements for the facility and forms the basis for negotiation of architect-engineer contracts. Diagrammatic drawings or concept drawings provide the basis for the first review of the architect's design. Tentative drawings or architect's design are provided by the architect for firming up cost estimates and basis for developing the completed, and final working drawings.

Location and Purpose	Year	Amount of Funds Provided	Description
California, Albany Plant Gene Expression Center, Greenhouse	1989 Construction	$700,000	Design was completed the third quarter of FY 1989. Award of a construction contract was made the fourth quarter FY 1989 and will be completed the first quarter of FY 1991.
California, Riverside U.S. Salinity Laboratory	1987 Plans	1,000,000	A contract for design was awarded the third quarter of FY 1988 and will be completed the second quarter of FY 1990. No construction can be started until the design is complete and the total construction has been funded.
	1989 Construction	900,000	
	1990 Construction	2,000,000	
	Total	3,900,000	
Colorado, Ft. Collins National Seed Storage Laboratory	1988 Plans	1,000,000	A contract for design was awarded the first quarter of FY 1989 and will be completed the second quarter of FY 1990. The project is being designed in accordance with a need for $12.3 million construction budget. No construction can be started until the design is complete and construction has been funded.
	1989 Construction	2,750,000	
	1990 Construction	5,500,000	
	Total	9,250,000	
District of Columbia U.S. National Arboretum, Brickyard Upgrade and New York Avenue entrance upgrade	1989 Reprogrammed for Design and Construction	2,000,000 (a)	Design will begin in the first quarter of FY 1990 and will be completed in the third quarter of FY 1990. Construction will be awarded in the fourth quarter of FY 1990 and will be completed in the fourth quarter of FY 1991.
Idaho, Oregon and Washington Northwest Small Fruit Center	1990 Feasibility Study	50,000	ARS will conduct a feasibility study for construction of a facility for small fruit research. The report will be available by the close of fiscal year 1990.

Status of Construction Projects as of December 1989 (con't.)

Location and Purpose	Year	Amount of Funds Provided	Description
Iowa, Ames National Soil Tilth Center	1984 Plans 1985 Construction Total	800,000 11,100,000 11,900,000	Construction was awarded in the first quarter of FY 1987 and completed in the second quarter of FY 1989. A second phase of work for a rhizotron requirement within the existing facility is scheduled to be awarded in the third quarter of FY 1990 and completed in the second quarter of FY 1991.
Maryland, Beltsville Building 007 ($2 Million) General Upgrading of Facilities ($2.6 Million) Clean and Reline Water Lines ($1.15 Million)	1988 Plans and Construction	5,750,000	The Building 007 construction contract was awarded during the fourth quarter of FY 1988. The general upgrading of facilities line item has been allocated to design or construction contracts for Buildings 003, 204, 264, 303, 306, 307, 476, and a small animal facility. A design contract for the cleaning and relining of water lines was awarded the fourth quarter of FY 1989 and is scheduled for construction contract award the fourth quarter of FY 1990.
Animal Research Bldg. for Human Nutrition	1989 Recovered Funds	825,938 (a)	Design contract awarded the second quarter of FY 1989 and will be completed the first quarter of FY 1990. Contract for construction is scheduled for award the second quarter of FY 1990.
Nebraska, Clay Center Animal Health System Research Laboratory	1986 Reprogrammed for Planning and Construction 1989 Reprogrammed Total	4,000,000 +820,200 4,820,200	An A-E design contract was awarded the first quarter of FY 1987 and completed during the second quarter of FY 1988. Construction of the facility started the fourth quarter of FY 1988 and is scheduled for completion during the first quarter of FY 1990. FY 1989 Reprogrammed funds were used to purchase both fixed and movable equipment.

Status of Construction Projects as of December 1989 (con't.)

Location and Purpose	Year	Amount of Funds Provided	Description
Nebraska, Lincoln Old West Regional College of Veterinary Medicine	1983 Plans	827,000	Funds originally authorized for the establishment of the Old West Regional College of Veterinary Medicine have been reprogrammed. Funds in the amount of $4,000,000 were reprogrammed for construction and equipping of a facility for advanced studies in food animal medicine at Clay Center, Nebraska. A total of $7,000,000 was allocated to the Cooperative State Research Service in FY 1986. An additional $250,000 was allocated to CSRS in FY 1988. The balance of available funds will be used for the Meat Animal Research Animal Center in Clay Center, with approximately one-half of the funds to be used for equipment for the herd health system and the other one-half to be used for equipment for the meat safety assurance program.
	1984 Construction	12,050,000	
	1986 Reprogrammed	-4,000,000	
	1986 Transferred to CSRS	-7,000,000	
	1988 Transferred to CSRS	-250,000	
	1989 Reprogrammed	-820,200	
	Total	806,800	
New York, Plum Island Plum Island Animal Disease Center	1973 Plan	250,000	Pre-design to consolidate all laboratory facilities and evaluate the use of the existing vaccine research laboratory structure for joint Agricultural Research Service and Animal and Plant Health Inspection Service is scheduled to be completed the first quarter of FY 1990.
	1976 Construction	10,000,000	
	1977 Redirection	294,000 (b)	
	1977 Redirection	700,000 (c)	
	1978 Redirection	900,000 (d)	
	1981 Construction	10,100,000	
	Total	22,244,000	
	1989 Recovered Funds	8,828,273 (a)	These funds are to be used for consolidation of facilities at Plum Island.
Oklahoma, Lane South Central Agricultural Research Center Phase III Construction	1989 Plans	140,000	The award of a contract for design of Phase III is scheduled for the second quarter of FY 1990 and should be completed the first quarter of FY 1991.
	1990 Plans	150,000	
	Total	290,000	

Status of Construction Projects as of December 1989 (con't.)

Location and Purpose	Year	Amount of Funds Provided	Description
South Carolina, Charleston U.S. Vegetable Laboratory	1988 Feasibility 1990 Plan & Construction Total	50,000 1,135,000 1,185,000	Contract for the pre-design was awarded the second quarter of FY 1989 and was completed in the fourth quarter of FY 1989. No design or construction can be started until the project is fully funded.
Texas, Houston Children's Nutrition Research Center	1984 Plans 1984 Construction Total	5,500,000 49,000,000 54,500,000	Construction for the superstructure was awarded in the fourth quarter of FY 1986. All work is scheduled for completion in the second quarter of FY 1990
Texas, Lubbock Plant Stress and Water Conservation Laboratory	1978 Feasibility Study 1979 Plans 1984 Plans 1990 Plans Total	100,000 800,000 500,000 500,000 1,900,000	The project is on hold since a lease agreement for the site has not been finalized and full construction funding is not available. In the interim, a headhouse\greenhouse is being designed and construction funds are committed in FY 1990.
Texas, Weslaco ARS Bee Laboratory	1990 Plans	340,000	Design contract will be awarded in the fourth quarter of FY 1990 and completed the fourth quarter FY 1991.
Washington, Yakima U.S. Fruit and Vegetable Laboratory	1988 Plans 1989 Construction 1990 Construction Total	1,000,000 900,000 1,000,000 2,900,000	A-E contract award will be made the second quarter of FY 1990. Design is scheduled for completion the second quarter of FY 1991. No construction work can be started until the design is complete and the total construction has been funded.

Status of Construction Projects as of December 1989 (con't.)

Footnotes:

(a) The ARS has to date recovered $11,654,211 in satisfaction of judgment from prior year obligations and contract default settlement for the Planning and Construction of the Animal Diagnostic Center and the Animals Holding Wing at Plum Island, New York. The recovered funds are redirected as follows:

Greenport, Long Island, NY	Consolidation of Facilities at Plum Island, NY, Animal Disease Center	$8,828,273
Washington, D.C.	Construction project at the National Arboretum entrance at the New York Avenue corridor	2,000,000
Beltsville, MD	Beltsville Agricultural Research Center	825,938
	Total	11,654,211

(b) $194,000 was redirected from the air pollution abatement and sewage treatment project to provide funds for pollution abatement facilities in the animal and laboratory project as originally planned. An additional $100,000 has been redirected into the animal and laboratory projects from program funding.

(c) Due to cost escalation and to provide funds to complete facilities as originally planned and designed at the Plum Island animal and laboratory project, funds in the amount of $700,000 were redirected from Kearneysville, West Virginia, to PIADC.

(d) Program funds in the amount of $900,000 were reprogrammed to fund additional costs for this project.

AGRICULTURAL RESEARCH SERVICE

Passenger Motor Vehicles

The 1991 Budget Estimate does not include the purchase of additional passenger motor vehicles above the 472 passenger motor vehicles presently owned.

The passenger motor vehicles of Agricultural Research Service (ARS) are used almost exclusively by professional research investigators and technical consultants. In the course of their daily work these personnel may need to travel to individual farms, ranches, commercial firms, State agricultural experiment stations, etc. In this type of work a high degree of mobility is required. Use of common carriers is seldom feasible.

It is the policy of ARS to pool the use of motor vehicles for different activities in order to keep the number of vehicles to a minimum and reduce overall costs of maintenance. Monthly vehicle operation reports are required and periodic surveys are made to determine the extent to which vehicles are being used and their condition.

Replacement of passenger motor vehicles.

It is proposed to replace 46 of 472 vehicles currently in operation. These vehicles are located at field stations and are used in connection with research studies and technical assistance. Vehicle replacement is based on funding priority, program management, mileage, and age eligibility.

Age and Mileage Data for passenger-carrying vehicles on hand as of September 30, 1989.

Age-Year Model	Number of Vehicles*	Percent of Total	Lifetime Mileage (thousands)	Number of Vehicles*	Percent of Total
1984-older	338	72			
1985	29	6	80-over	64	14
1986	40	8	60-80	92	20
1987	23	5	40-60	125	26
1988	19	4	20-40	106	22
1989	23	5	Under 20	85	18
Total	472	100		472	100

*Includes six vehicles used in foreign countries and six buses.

Aircraft

The Agency currently maintains a fleet of seven aircraft, located at College Station, Texas, and Weslaco, Texas. These specially modified and equipped research aircraft are used in the development of pest control methods, application of agricultural materials, radar tracking of airborne insect migration, infrared and color photography, and evaluating effects of weather on agriculture.

Wednesday, March 7, 1990.

COOPERATIVE STATE RESEARCH SERVICE

WITNESSES

CHARLES E. HESS, ASSISTANT SECRETARY FOR SCIENCE AND EDUCATION

JOHN PATRICK JORDAN, ADMINISTRATOR, COOPERATIVE STATE RESEARCH SERVICE

CLARE I. HARRIS, ASSOCIATE ADMINISTRATOR, COOPERATIVE STATE RESEARCH SERVICE

WILLIAM D. CARLSON, ASSOCIATE ADMINISTRATOR, OFFICE OF GRANTS AND PROGRAM SYSTEMS

STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

Opening Remarks

Mr. Whitten. The committee will come to order.

May I say, Mr. Secretary, that yesterday we went into many questions that probably tie in with today's hearing more so than yesterday's, but they're all under your supervision.

So we're glad to hear from you at this time, and as I say, much of our development of our concerns was yesterday. I don't think we'll have to do the same thing today. Thank you very much.

Dr. Hess. Thank you, Mr. Chairman. Mr. Chairman, today we'd like to present the balance of the science and education budget proposal. Yesterday I did present an overview of the budget, and with your permission, I will turn the proceedings over to Dr. Jordan.

Dr. Jordan. Mr. Chairman, members of the subcommittee, I have submitted my formal testimony for the record, and if I might, Mr. Chairman, I would like to proceed to highlight it.

Mr. Whitten. We'll be glad to have your statement.

[Clerk's note.—The full text of Dr. Jordan's prepared statement appears on pages 380 through 390. The explanatory notes appear on pages 391 through 481.]

Mr. Whitten. I'm trying to talk about the things that face us all and arrive at some conclusion.

So you might go ahead and tell us what the answer is.

Statement of Dr. Jordan

Dr. Jordan. Mr. Chairman, as this committee is well aware, the Cooperative State Research Service is the agency through which the vast university-based system of the United States participates fully in the research and education program of the United States Department of Agriculture.

But it does even more than that. It goes beyond the land-grant institutions, and involves other institutions, although not to a large extent, but to a significant extent. Some private laboratory programs participate in the CSRS effort, also.

SELECTED SIGNIFICANT EXAMPLES

Every year, Mr. Chairman, you've allowed me the privilege of bringing to you some significant accomplishments and reviewing them for you.

Mr. WHITTEN. With all due deference, when we get to the floor, we don't have the answer unless we develop it here. I'll say again that I've been very proud of the Department of Agriculture's research program and the results we've had over the years.

It doesn't mean as big as it is and as many complications as it has that you don't have to work at it, but in the overall, I think we've done a great job. If we hadn't had research, as I said yesterday, we'd all be going hungry today.

Now we've got to watch that the State Department doesn't give it all away, but that's neither here nor there.

Dr. JORDAN. Thank you, Mr. Chairman.

In your packet is a document called Accomplishments Report. It adds additional accomplishments to those that are included in the Explanatory Notes which have been forwarded to you earlier. In the packet are several products that are the result of research at the land-grant universities. Each item has been tagged with a brief description of the related research.

It includes some work on barley, it includes some peanut work, and it also includes some mechanical work on a melt-blown material that removes fat during the cooking process.

The Accomplishments Report also contains some individual accomplishments, because, Mr. Chairman, I think you'd be proud of the fact that the Department of Agriculture, over the last five years, has given its distinguished and superior service awards not only to those within the USDA but also to those from the university-based system that have made major contributions in the research and education arena, as well as Extension.

If I could present a few highlights, I'll just take three or four of them quickly to bring to your attention.

Mr. WHITTEN. We'll be glad to have you do so.

Dr. JORDAN. The application of the Integrated Pest Management Principles at North Carolina State University has led to an economically and environmentally acceptable system for combating a pest complex of soybeans.

It's the result, Mr. Chairman, of a special research grant in the IPM area. North Carolina is now recommending crop rotation as the most economically feasible means of combating that dreaded soybean cyst nematode and the associated pest problems.

It's a fairly simple solution, but it took a lot of work to be sure that it was the best and most economical one to put into effect.

In the State of Indiana, researchers supported by Hatch Act funds have developed an instrument to assess the fat percentage of hog carcasses in just a few seconds, and this is a marked improvement.

In fact, there's an organization that's putting this into effect commercially in Indiana. They are buying and selling meat based upon the pounds of muscle rather than the whole carcass, so that's going to be a marked improvement that I think we'll see across the country soon.

In terms of the Evans-Allen Program, Mr. Chairman, you've been a strong supporter of it and in the State of Georgia at Fort Valley State College, researchers have been issued a U.S. Patent on a container that can be used for precooling, shipping and storage of fruits and vegetables.

The beauty of this is that you can carry fruits and vegetables hundreds of miles in non-refrigerated trucks. It's a reusable container, and it will reduce markedly the cost of taking to market fruits and vegetables.

Pseudorabies is a significant and costly disease of swine resulting in productivity losses and death in young animals. One of the real problems that we've had in this arena, Mr. Chairman, is we've known that recovered swine serve as a source of latent infectious virus, but we haven't known where the infection was localized.

Researchers at the University of Nebraska, Mrs. Smith, have found that the herpesvirus that's associated with this disease establishes a latent infection in the nervous system.

This research. is a result of the competitive research grant program. We really didn't know which direction to go with the research but it has been very effective.

NATIONAL INITIATIVE FOR RESEARCH ON AGRICULTURE, FOOD AND THE ENVIRONMENT

As this committee has pointed out to us on many occasions, agriculture in the 1990's must provide better stewardship of the environment or a rational use of natural resources, improve the quality and nutrition of food, and economically stabilize production systems in order to continue the benefit to both producers as well as consumers.

In 1991, as highlighted in Secretary Hess's testimony yesterday, $100 million is being proposed for a new National Initiative for Research on Agriculture, Food and the Environment.

Mr. **Whitten**. You know, yesterday, you forgot to tell us, if you're going to farm out all your research projects, how many people can we reduce in your operation?

Dr. **Jordan**. Of course, the CSRS does not conduct research, as you well know, Mr. Chairman, and it does take a few people to process research grants.

Mr. **Whitten**. Well, I forgot to ask that of the Secretary yesterday. Go ahead.

Dr. **Jordan**. What we have is the headquarters people that administer all CSRS programs.

This initiative will respond to the major issues facing agriculture, such as food safety, water quality, global climate change, pest management, scientific human capital development, farm income and market competitiveness. It will allow U.S. agriculture to broaden the science and technology base to more effectively meet these demanding needs and to exploit new opportunities for all of agriculture.

As Secretary Hess stated yesterday, a recent report from the Board on Agriculture of the National Academy of Sciences' National Research Council entitled Investing in Research: A Proposal to Strengthen the Agricultural, Food and Environmental System, recommends the establishment of a major boost in agricultural research with new funding of $500 million a year.

The Initiative has evolved as a broad National consensus of USDA research agencies, Federal and State scientists, conservationists, environmentalists, consumers, producers and processors of food and fiber, along with their related industries.

Congruent with that recommendation, the USDA and its cooperators, Mr. Chairman, in their National planning activities have identified virtually identical National research initiatives that require major funding for the National good.

In your packet, you will see a second booklet called Program Plan for the National Initiative for Research on Agriculture, Food and the Environment. The booklet contains the concept, the justification for the Initiative, and it also lays out the program planning process.

I bring to your attention pages 12 and 13 in which are listed well over 130 organizations that participated in building this program plan and putting this idea into motion.

The CSRS budget includes $100 million in fiscal year 1991 to begin this process. There are six research components proposed in the Initiative.

The $100 million will fund, first of all, $15 million in Natural Resources and the Environment, and that includes work on global change, water quality and sustainable agriculture; there is also $5 million for Nutrition, Food Quality and Health; $50 million, for the Plant Systems research program, which includes $15 million for the Plant Genome Mapping Program with the Agricultural Research Service as the lead agency on that particular program; and finally, $30 million for the Animal Systems Program, which would have heavy focus on animal health.

The Initiative includes a commitment from the Administration for annual increases of $50 million a year, provided the funds are made available on a competitively awarded grant basis.

Plans for subsequent years, Mr. Chairman, include programs and processes that lead to new products and adding of value to existing products, as well as markets, trade and policy research.

Federal funding for the Initiative is necessary because, first of all, the issues and opportunities are National in scope. The Nation, as a whole, is the beneficiary of this effort, not just individual States or industries.

Second, the initiative undertakes research that does not generally produce directly specific patentable or marketable products, but knowledge that's broadly applicable to lead to the development of patentable and marketable products.

Third, the need is urgent. It's been described by the industries through the program planning process, and they feel a very serious commitment to preventing a delay or a piecemeal build-up of the program.

Fourth, the health and vigor of a major segment of the U.S. industry is at stake in terms of international competitiveness, and finally, there are benefits, although difficult to measure in economic terms, related to the protection of the environment and public health.

What this will do will increase effectively the competitively awarded programs of the USDA science and education programs from about five percent to about eight percent of its total, about a three percent increase overall.

It will help increase funding for the intramural program, because all the Federal laboratories will also be able to compete for this.

ARS has traditionally won significant amounts from the Competitive Research Grants Program. It will help in the extramural program because not only will it fund that core of land-grant institutions who have been very successful in the Competitive Research Grants Program, but also will bring to bear on agricultural issues fine scientific minds from many other institutions.

Maybe we don't buy their career, but we can buy their talent for a particular project at a particular time. We expect to have four different kinds of grants, Mr. Chairman, in this program area.

The first is the individual investigator initiated grant, and that would account for about 40 percent in our program plan. That's very much like the current Competitive Research Grants Program.

The second, though, has a new dimension to it. About 30 percent of the program will be focused on multidisciplinary team research grants. This recognizes that many of the difficult problems of today require more than one discipline to come to bear on an issue in order to derive the appropriate answer.

A third part is really fresh and new for us. Twenty percent of the program will be directed specifically at mission-linked multidisciplinary research, and it's in this category, Mr. Chairman, that the Plant Genome Mapping Program, under the leadership of the Agricultural Research Service, will fit.

There will be other programs in this area that might be led by other agencies of the USDA, as well. Finally, ten percent of the program is identified for institutional strengthening grants. These will be particularly attractive to institutions who do not possess a track record of high success in the competitive research grants process. Also, there will be available through this process a limited number of post-doctoral fellowships for institutions to build up their scientific talent.

The program would be open to all public and private universities, research organizations, Federal agencies, private non-profit organizations and corporations, and individuals who will be eligible to compete in the program.

The Initiative will allow the average amount of the USDA competitive research grant to be increased and the average duration to be extended consistent with those grants awarded through the National Science Foundation or the National Institutes of Health.

BUDGET RECOMMENDATION

In addition to the National Research Initiative, Mr. Chairman, we always fall back on that tremendous base funded program that you put in our budget annually, the Hatch, McIntire-Stennis, and Evans-Allen programs.

They're the foundation upon which the remaining Federal grants, including special and competitive research grants, plus State and private industry funds, build.

Funding for these base programs is a high priority because they support the basic laboratory facilities, scientists and graduate students so very necessary for the long term stability of agricultural research.

These programs allow the institution's maximum flexibility to support research of the highest priority, and at the same time assure a strong working relationship between the USDA and the State Agricultural Experiment Station system of our country.

The CSRS budget request also includes funding for selected special research grants. We've asked for more this year than in the past three years.

Mr. Whitten. The regular program we've had for years that brought all these results, after you talk about the new things, then you say also.

Dr. Jordan. Well, we think this is a very important part.

Mr. Whitten. Does that mean you lose interest in that side or you've got second-rate interest in what you've been doing all along?

Dr. Jordan. Oh, no. No, sir, on the contrary. We think this is one of the key points.

Mr. Whitten. That's an odd way to express it, to tell all the new things, and then say also we've taken care of those. It sounds like it's become second-rate.

Dr. Jordan. No, sir, it really isn't.

Mr. Whitten. I said how it sounds. I'm trying to give you a chance to clarify the record. You might go ahead.

Dr. Jordan. What I'd like to bring to your attention, sir, is that this year we've brought you the largest special grant request in the history of the Department, $25.5 million.

That's up substantially from a year ago and up a great deal from two years ago.

[Additional information follows:]

SPECIAL RESEARCH GRANTS BUDGET REQUESTS

Fiscal year	Request	Appropriation
1988		$31,185,000
1989	$4,977,000	41,886,000
1990	15,123,000	56,543,000
1991	25,597,000	

REDUCTIONS IN THE BUDGET REQUEST

Mr. Whitten. It sounds like you haven't read the papers recently. Do you know where the increases are coming from? Let me read it at this point.

These increases you're talking about, in the President's budget, he calls for cutting back on our Federal Highway Program by $1 billion; Amtrak, $650,000,000; EDA grants, $189,000,000; EPA sewage treatment, $392,000,000; assisted rural housing, $588 million; mass transit, $548 million; community block grants, $363 million; rural housing direct loans, $883 million; farm ownership loans, $394 billion; and farm operating loans, $400 million. There are 65 additional cuts that we face proposed in the budget.

The Nation's trade deficit is $170 billion in the red. Our debt has increased $2 trillion dollars in ten years. And you ask us for the biggest competitive grant program in the history of the country, after telling us what a good job you've already done with the existing research programs.

Doesn't that kind of strike you as amusing?

Dr. JORDAN. Well, sir, I hope it's a rational——

Mr. WHITTEN. I'm not talking about your hopes. I'm talking about what you think.

Dr. JORDAN. Well, I think these special research grants are important——

Mr. WHITTEN. Don't you think it's unfair to ask us to do this new program when we're having to face all these other things? How would you explain it if you were on this side of the table?

Dr. JORDAN. In terms of the special research grants, sir?

COMPETITIVE GRANTS

Mr. WHITTEN. Giving you all this increase to a new program at the expense of all these other programs. If you were in our fix, how would you explain that? Mrs. Smith's going to retire, so she could explain it easily. I want the record to show how long it took him to answer.

Dr. HESS. Mr. Chairman, one indication, however, is that the return on investments in agricultural research are tremendous.

Mr. WHITTEN. That could easily be, but may I say you're talking about prospectives, because you haven't got it yet.

Dr. HESS. I realize that, sir.

Mr. WHITTEN. You're talking about high hopes. You might go ahead.

Dr. JORDAN. Thank you. Perhaps, at least, we could recognize that the track record is fairly good up until now. You're absolutely right, sir.

Mr. WHITTEN. But you're changing the track. You're buying a pig in a poke. You're telling us what you hope it will do, but if you're going to farm this out to the universities, why is it you want to keep them from having to report to this committee each year?

Dr. JORDAN. Sir, we'd like the opportunity.

Mr. WHITTEN. I mean, what's wrong with us asking them questions about what they're doing?

Dr. JORDAN. There's not only nothing wrong with it, sir, I think it's exactly the right way to do it.

Mr. WHITTEN. Well, that's not the way competitive research works.

Dr. JORDAN. You have in your packet, sir, a report on all the competitively awarded grants for 1989.

Mr. WHITTEN. Well, I mean, I was serious a while ago. How many folks can you spare if you're going to farm out your job?

Dr. JORDAN. Well, there is no——

Mr. WHITTEN. If the university's going to do it, you don't need the same people that used to do it, do you?

Dr. JORDAN. Well, at the moment, that's all we do in the CSRS arena.

Mr. WHITTEN. I know, but I'm asking what you're asking us to do in your request.

Dr. JORDAN. I think——

Mr. WHITTEN. If you're going to farm out all of this work, how many people do we need to keep with the Department?

Dr. JORDAN. Around 200, to manage that program.

Mr. WHITTEN. That's what you've got now, but you don't need all those if you're going to give your jobs to the universities.

Dr. JORDAN. Well, those are the same people that are putting the money out to the universities, the Federal laboratories, and to private industry today, sir.

LACK OF SUPPORT FOR AGRICULTURE

Mr. WHITTEN. I think that to ask us for this new program at this time is kind of shortsighted, in view of the fact that it would have to come at the expense of all these other programs. These other programs have by far the majority of Members of Congress in support of them.

We find that land grant colleges, in selecting a new president, don't even ask them about agriculture. We have buildings at colleges where we had to go to bat to get the agricultural people to be able to use them.

As I said yesterday, the number of folks studying agriculture, unless it's for a job like you have or I have, is getting fewer and fewer. In most cases those that are studing agriculture are the sons and daughters of farmers, because the new people are not going in it because they see that agriculture is being kicked around at the highest level of government.

So I'm just saying do what you want to do, but I think you're starry-eyed when you ask us to cut all these programs in the same budget where you want these increases.

Dr. JORDAN. We hope, Mr. Chairman, we brought you a program to help attract those kinds of things.

Mr. WHITTEN. I hope I wake up and everything is fine up here, but I'm not counting on it very much.

SPECIAL RESEARCH GRANTS

Dr. JORDAN. May I progress, Mr. Chairman, and tell you which special research grants we think are very high priority?

Mr. WHITTEN. Did you say special or competitive?

Dr. JORDAN. Special.

Mr. WHITTEN. Go right ahead.

Dr. JORDAN. We're focusing on the integrated pest management program, minor use animal drugs, the National Biological Impact Assessment Program, pesticide clearance, and pesticide impact assessment. We also have a $10 million component for water quality research in which the Midwest corn belt and other major agricultural production regions will be major areas of focus. A new grant program in global change is requested at $5 million for research as a part of the Federal initiative coordinated by the Committee on Earth Sciences. Emphasis of this work will be on understanding better agriculture's contributions of methane and other gases to the atmosphere, and to develop the strategies to ameliorate those impacts.

It's really in the spirit of total partnership, Mr. Chairman, that we see all three programs, the formula program, the special research grants program, and the competitively awarded research program, as fitting all together, each having a different function, each fitting into a specific niche.

I think as far as we view it, Mr. Chairman, the farmers in America are on a technological treadmill, in all honesty. Many other countries use low labor costs or low land values as major competitive tools, and we're using knowledge as that basis.

So we need a portfolio of programs and funding mechanisms. We can't do without any of them. We need them all to support the needed research.

Mr. WHITTEN. You use the word can't. If you don't get it, you can. You said you can't do this without——

Dr. JORDAN. Without proposing that any of them be left out, that's correct, sir.

Mr. WHITTEN. Well, that's a rather firm position to take on your side of the table.

Dr. JORDAN. Well, that's what we're proposing, sir. We understand that we propose and you dispose.

Mr. WHITTEN. We'll try to help you when we can.

Dr. JORDAN. Yes, sir.

Mr. WHITTEN. You might go ahead.

HIGHER EDUCATION

Dr. JORDAN. The National Needs Graduate Fellowships Program recruits and trains doctoral and masters fellows in targeted shortage areas, such as biotechnology, bioprocessing and engineering, food science and human nutrition, marketing and water science.

Grants are awarded competitively to institutions identified as being those with the best programs of both teaching and research in the targeted areas, and we've asked for an increase in this area to a level of $4 million for fiscal year 1991.

The Institution Challenge Grants Program, new in 1990, is designed to revitalize the educational system, which is primarily responsible for training the food and agricultural scientists and professionals. It stimulates the private sector to match dollar for dollar the Federal partner in providing support to strengthen the infrastructure of U.S. food and agriculture. We've asked for a doubling of that program to $2 million to foster partnership ventures among universities, industry and Government.

The 1890 Institution Capacity Building Grants Program serves as the crux of the Department's high priority initiative to advance the capacity of the 1890 institutions, including Tuskegee University. CSRS is requesting a doubling of that program to $11 million for fiscal year 1991. It is also a competitively awarded program that requires cooperation of one or more USDA agencies in developing the proposal and in carrying it out. What we ask the institution to do is to identify those areas where they are building a center of excellence and to have that consistent with the proposal that they're submitting.

Following the instructions of this committee, we have encouraged institutions to obtain matching funds. We have not required it. The encouragement has been effective, though. A large number of institutions have received matching funds for fiscal year 1990 from their States or from private industry, and several others have been allowed to request it for 1991.

Mr. WHITTEN. I hate to interrupt you, but we have a roll call, and we have to go vote, and then we'll be back. Excuse us.

[Recess.]

Mr. WHITTEN. You might go ahead. We'll be glad to have you proceed. I'm sorry about the interruption, but we had a vote.

Dr. JORDAN. Mr. Chairman, I think I've completed my formal presentation, and I'd be delighted to answer questions.

SUPPORT FOR COOPERATIVE RESEARCH

Mr. WHITTEN. We talk a whole lot, and particularly some of us on this side of the table, but I'm a strong believer in cooperative research.

You know, after all, it's getting the money and getting the job done and keeping support in Congress. I'm proud of the support that we on this committee have had in Congress. More and more people are urban and it's getting where fewer and fewer people are engaged in agriculture.

But I know from having been on the committee for years that agriculture still remains our biggest industry, our biggest dollar earner in world trade and our biggest employer.

I've tried for years to point out that if we let it go down as I think they're doing that now, not through your fault, that sooner or later it's going to get the Federal Government. I think that time has about arrived, if you look at our financial situation.

I've learned from your side of the table about climatic conditions. As I've said, there are trees that do well here in Washington but don't do well in my home town. So climate and location has something to do with it.

The other side is sometimes you just need some annual supervision. I was here when one State used the research money to grow vegetables for the students and faculty at the university.

A whole lot of different things have happened since I've been here, so a little oversight doesn't hurt, and there's a real need to have local people involved, and despite the fact that the average land-grant university, and it's not their fault, finds that their attention more and more is directed in other ways, because that's what the students demand.

I don't know how well I do, but as I say again, if we don't ask you questions and get the answers, when we get to the floor, we don't know and can't answer the Member's questions.

Maybe we talk a little differently when we get on the floor, because we're trying to persuade and so forth. But we do appreciate your appearance and appreciate the job you all do.

If I may say so, your job gets harder and harder as ours gets harder, because most people today just don't understand agriculture.

Let me now turn to some specific questions on your budget request.

FISCAL YEAR 1991 BUDGET REQUEST

Mr. WHITTEN. Would you please, at this point in the record, insert a table similar to the table which appears on page 31 of the 1991 Budget Summary of the Department of Agriculture, since this table reflects in summary fashion the programs we will be discussing?

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE

Program Level
(Dollars in Millions)

Program	1989 Actual	1990 Current Estimate	1991 Budget
Hatch Act formula	$154.7	$155.1	$158.5
1890 Colleges and Tuskegee formula	24.3	25.0	26.2
1890 capacity building grants	0.0	5.5	11.0
Cooperative forestry formula	17.5	17.3	13.0
Special research grants	42.6	56.3	25.6
Critical Ag. Materials Act	3.7	5.3	0.0
Competitive research grants	39.7	42.5	a/
National Research Initiative:			
Plant systems	0.0	0.0	50.0
Animal systems	0.0	0.0	30.0
Nutrition, food quality & health	0.0	0.0	5.0
Natural resources & environment	0.0	0.0	15.0
Subtotal	0.0	0.0	100.0
Animal health and disease formula (Sec. 1433)	5.5	5.4	0.0
Aquaculture research centers	3.7	3.7	0.0
Alternative crops research	1.0	0.3	0.9
International trade centers	3.2	3.1	0.0
Low-input/sustainable agriculture	4.5	4.4	4.5
Groundwater research	3.0	b/	b/
Fed. administration (direct approp.)	6.4	7.9	1.2
Higher education	4.8	5.9	6.0
Morrill-Nelson higher education grants	2.8	2.8	0.0
Subtotal	317.4	340.5	346.9
Buildings and facilities	29.6	45.1	0.0
Total	$347.0	$385.6	$346.9

a/ Incorporated within National Research Initiative.

b/ Funded within special grants at $6.7 million in 1990 and $10.0 million in 1991.

FISCAL YEAR 1991 BUDGET REQUEST

Mr. WHITTEN. Please provide for the record the fiscal year 1991 budget funding level, by program, requested by the Cooperative State Research Service to the Secretary, the level requested by the Secretary to OMB, and the final OMB allowance. We would like to see this information in the categories reflected in the summary table previously requested.

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE
1991 History Record
Budget Authority
(Dollars in Thousands)

	1990 Estimate	1991 Agency Estimate	1991 Department Estimate	1991 Budget
Payments under the Hatch Act....	157,045	173,122	163,777	158,545
Cooperative Forestry Research...	17,500	19,477	13,403	12,975
Payments to 1890 Colleges and Tuskegee University...........	25,333	26,169	26,169	26,169
Special Research Grants.........	74,063	73,268	43,806	30,965
Competitive Research Grants - National Research Initiative..	43,066	97,666	150,000	100,000
Animal Health and Disease Research, Section 1433........	5,476	0	0	0
Federal Administration (Direct (appropriation)...............	13,507	13,573	12,239	12,239
Higher Education................	6,004	20,000	8,000	6,000
Subtotal, Cooperative State Research Service..............	341,994	423,275	417,394	346,893
Morrill-Nelson	2,850	0	0	0
Subtotal, CSRS	344,844	423,275	417,394	346,893
Buildings and Facilities	45,686	0	0	0
Total, CSRS	390,530	423,275	417,394	346,893

OBLIGATIONS UNDER OTHER USDA APPROPRIATIONS

Mr. WHITTEN. According to the notes, you will be receiving $80,925 from the Office of Small Scale Agriculture of the Agricultural Research Service. How are these funds used?

Dr. JORDAN. The Office of Small-Scale Agriculture—OSSA—was established by the Secretary of Agriculture in December 1986. OSSA was created to improve the flow of information about small-scale farming to agricultural producers and consumers. The office also serves as a liaison to other USDA agencies in identifying and directing research and educational programs to improve the usefulness of information received by small-scale farmers. This funding provides partial support of OSSA activities which include: the publication of a quarterly newsletter, a factsheet series and a small-scale agriculture directory; the development of a small-scale agriculture video; an assessment of ongoing USDA research and extension programs in the area of small-scale agriculture and, the monitoring and implementing of small-scale agriculture conferences and events in coordination with other USDA agencies.

Mr. WHITTEN. From the Extension Service you will receive $188,652 in fiscal years 1990 and 1991 for science and education programs. How are these funds used?

Dr. JORDAN. CSRS carries out a number of programs on behalf of all the Science and Education agencies including programs on Agriculture in the Classroom, small-scale agriculture, alternative and supplemental crops, low-input sustainable agriculture, and aquaculture. These funds from the Extension Service, as will as funds from the Agricultural Research Service and the National Agricultural Library, contribute towards a portion of the operating funds needed to administer these programs. Some of these funds are also used to support the activities of the Office of Agricultural Biotechnology and the Joint Council on Food and Agricultural Sciences.

Mr. WHITTEN. In fiscal years 1989 and 1990, you received $83,095 for the International Trade Pilot Project of the Foreign Agricultural Service. What was this project and how were these funds used?

Dr. JORDAN. The purpose of this pilot project is to develop a program to provide firms assistance in the preparation of export market feasibility studies and conduct seminars on how firms can achieve export marketing objectives. The firms targeted for this project are producers and processors of agricultural commodities and products located in the States of Oklahoma, Kansas, Arkansas, and Missouri. Completion of this pilot project is expected to require two years.

SMALL BUSINESS INNOVATION RESEARCH PROGRAM

Mr. WHITTEN. During fiscal years 1990 and 1991 you will receive $275,000 from various agencies sharing the cost of the USDA Small Business Innovation Research Program. What is this program and how are these funds used?

Dr. JORDAN. All Federal agencies that spend more than $100 million on extramural research are required to set aside 1.25% of these funds for a SBIR program. In Fiscal Year 1990, seven different agencies of the U.S. Department of Agriculture will contribute $4,106,091 for the Small Business Innovation Research—SBIR—program. Because over 93 percent of the funds come from CSRS, the SBIR program is administered by CSRS but the SBIR program is a Department-wide program with seven broad topic areas in 1990 that encompass virtually all areas of scientific/technical research dealing with agriculture. The topic areas are Forests and Related Resources, Plant Production and Protection, Animal Production and Protection, Air, Water and Soils, Food Science and Nutrition, Rural and Community Development, and Aquaculture.

The Small Business Innovation Research program was established in 1983 in order to stimulate technological innovation in the private sector, to strengthen the role of small business in meeting Federal research and development needs, to increase private sector commercialization and development efforts, and to encourage participation of small and disadvantaged firms in technological innovation.

Small businesses compete initially for Phase I grants. These grants are limited to six months and $50,000 and are designed to determine technical feasibility of the proposed approach or concept. Companies that receive Phase I grants are eligible to apply for Phase II grants that run for two years, average $200,000, and constitute the principal research or research and development effort. Following the Phase II effort, the small business is encouraged to seek non-Federal support for Phase III in order to take the research and development effort to the point of commercialization.

The USDA SBIR program supports high-quality research and development proposals containing advanced concepts related to important agricultural problems and opportunities that could lead to significant public benefits. Over the past four years the number of Phase I applications has increased from 178 to 314. Applications come from nearly every state, and since the program started in 1983, grants have been awarded to small businesses in 42 different states and the District of Columbia.

OTHER FEDERAL FUNDS

Mr. WHITTEN. From AID–PASA you will receive $484,127 in fiscal years 1989, 1990, and 1991. How are these funds used?

Dr. JORDAN. These funds are used to support cooperative and/or joint research, through grants to U.S. research institutions or scientists, to overcome specific obstacles to technological breakthrough at the International Agricultural Research Centers—IARCs—which the IARCs lack the capability to address alone. All grants are made on a merit basis. Many of the research results have application to U.S. agriculture as well as helping to increase agricultural production and food availability in the lesser developed countries. This program has also strengthened research linkages between U.S. and foreign scientists.

Mr. WHITTEN. You are receiving $200,000 a year from the Department of Defense for "The Effects of Aircraft Noise on Animals." How are these funds used and where is this research carried out?

Dr. JORDAN. These funds are being used to evaluate the effects of aircraft noise on milk yield and overall animal performance of dairy cattle, and the effects on pregnant mares and their foals for two months after birth. The study is being conducted by the College of Veterinary Medicine and the Agricultural Experiment Station, University of Florida.

GUAYULE RESEARCH PROJECT

Mr. WHITTEN. According to the notes you will receive $766,560 in fiscal year 1989 from the Department of Defense for the guayule research project. Has the Department of Defense now terminated this research project?

Dr. JORDAN. The triservice—Navy, Army, Air Force—program in the Department of Defense—DoD—for evaluating guayule natural rubber was terminated after 12 years on September 12, 1989. The program was undertaken to qualify guayule as an approved source of natural rubber for DoD use and, if possible, to stimulate a viable commercial industry. Prior to termination, DoD transferred program funds to USDA to supplement agricultural programs for breeding/genetics and for coproduct development. DoD contracts remain in place for manufacture of aircraft tires by Goodyear and truck tires by Firestone. Inter-service agreements also remain in place for field testing and evaluation of tires by the three services.

PERMANENT POSITIONS

Mr. WHITTEN. According to page 8-4 of the explanatory notes your agency will increase from 158 permanent positions in 1989 up to 198 permanent positions in 1991. Why are these additional positions needed?

Dr. JORDAN. Over the last several years, CSRS has been asked to assume a number of new responsibilities on behalf of the Department in such areas as biotechnology, small-scale agriculture, and new and alternative uses of crops. Consequently, CSRS exceeded its fiscal year 1989 personnel ceiling by 17 staff-years. Also, additional personnel are needed to manage new and expanding programs such as the 1890 Capacity Building Grants program, the Higher Education Institution Challenge Grants program, the Buildings and Facilities program, as well as the National Research Initiative. This increase in permanent positions will help to alleviate this situation.

Mr. WHITTEN. How many of the 40 positions are scientific positions, how many are professional nonscientific positions, and how many are clerical.

Dr. JORDAN. We currently anticipate that these 40 positions are split as follows: fourteen scientific positions, eighteen professional nonscientific positions, and eight clerical positions.

CLASSIFICATION BY OBJECTS

Mr. WHITTEN. Would you please provide for the record a subobject class breakdown for the Other Services account as it appears on page 8-5 of the notes?

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE
SUB-OBJECT CLASS BREAKDOWN OF OTHER SERVICES

OTHER SERVICES	1989	1990	1991
Services performed by other Federal agencies	$185,563	$185,563	$185,563
Training, tuition, fees, and security investigations	48,018	50,018	52,018
Repair, alteration, or maintenance of equipment and furniture	127,595	132,699	138,272
Contractual services - includes peer panel honorarium	92,641	102,641	143,641
Agreements - Cooperative and Reimbursable	3,932,084	4,386,377	1,722,094
ADP data processing services and supplies	25,311	25,311	25,311
Fees and other miscellaneous services	311,080	311,080	211,080
Total, other services	4,722,292	5,193,689	2,477,979

GROUNDWATER QUALITY

Mr. WHITTEN. Please provide a description of the work that has been done under the groundwater quality program to date and the period of the existing contract.

Dr. JORDAN. The research grant earmarked for the University of North Dakota, Grand Forks, in FY 1989 is supporting research to develop experimental protocols and site characterization for ground water research in representative geological areas. North Dakota State University has been given a sub-award and is conducting research on movement and spatial distribution of selected herbicides in coarse-textured irrigated soils.

The research grant earmarked for Iowa State University in Fiscal Year 1989 is supporting research to develop and investigate agricultural chemical management and crop and soil management systems in areas drained by agricultural drainage wells in northern Iowa, which now may permit direct flow from surface run-off into underground aquifers.

Competitively-awarded grants made in fiscal year 1989 are supporting research under 23 agreements selected under national competition, and is supporting research in 26 states. Research is being conducted on organic pesticides, chemistry, degradation, and management; metals and nitrogen sources, availability, movement, and transformations; physics and hydrology of solute movement through soils; microbial reactions and degradation; and economic evaluation of production practice alternatives.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated for fiscal year 1990?

Dr. JORDAN. In FY 1989, $3,000,000 was provided of which $168,000 was for Iowa and $1,000,000 for North Dakota. In FY 1990, funding for water quality is provided in Special Research Grants and Direct Federal Administration.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research under the FY 1989 earmarked grants to North Dakota and Iowa is being conducted at the University of North Dakota at Grand Rapids, with a sub-award to North Dakota State University at Fargo, and at Iowa State University at Ames, respectively.

The competitively-selected awards on water quality funded in FY 1989 were made to nine states in the CSRS North Central Region, five states in the Northeastern Region, six states in the Southern Region, and six states in the Western Region.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research is underway at the University of North Dakota and North Dakota State University to collect data on representative research sites, survey agricultural chemical application rates, and to develop groundwater quality experimental protocols and hydrologic protocols related to groundwater.

Research at Iowa State University is continuing to develop agricultural chemical, crop, and soil management strategies to prevent agricultural chemicals from moving directly by surface run-off from agricultural lands through pothole drainage wells in northern Iowa into underground aquifers.

Research under the competitively-awarded national-scope program funded in FY 1989 has permitted initiation of groundwater research in 26 states on problem areas that potentially effect groundwater quality at each location.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. Because of the complexity of groundwater quality problems, much of this research will be long-term. To continue their work, researchers may compete for grants under the Special Research Grants and National Research Initiative programs for water quality.

WATER QUALITY, NORTH DAKOTA

Mr. **Whitten**. Please provide a description of the work that has been done under the water quality program to date and the period of the existing contract.

Dr. **Jordan**. CSRS has requested the university to submit a grant proposal that has not yet been received. A proposal is being prepared to expand research, initiated with FY 1989 funding from the groundwater research program, on development of experimental protocols and site characterization for ground water research in representative geologic settings.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. Beginning in 1990, funds have been earmarked under the Direct Federal Administration program. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $987,000. In 1989 $1.0 million was appropriated under the groundwater research program.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research will be conducted at the University of North Dakota, with related research on a sub-award at North Dakota State University.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The proposal for fiscal year 1990 research is presently being prepared by the University. Research proposed will expand on ongoing research to develop new experimental protocols for research on groundwater, and to develop site characterization at several geologic sites. Research at North Dakota State University will develop better understanding of the movement and spatial distribution of selcted pesticides in coarse-textured irrigated soils.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The university researchers have not yet indicated the time required to complete the objectives of this research. The research proposal is still being prepared by the university. To continue their work, researchers may compete for grants under the Special Research Grants and National Research Initiative programs for water quality.

WATER QUALITY, ILLINOIS

Mr. WHITTEN. Please provide a description of the work that has been done under the water quality program to date and the period of the existing contract.

Dr. JORDAN. The proposed program on groundwater quality for 1990 includes enhancement of relevant research and sponsoring a planning conference in the summer of 1990.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supportd by this grant under the Direct Federal Administration program begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $494,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Work will be conducted at Southern Illinois University at Carbondale and at other locations through the Illinois Groundwater Consortium including the Illinois State Geological Survey, Illinois Water Survey, the University of Illinois Agricultural Experiment Station, and Extension Service.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Southern Illinois University has just submitted a draft proposal that is currently being reviewed.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers have not yet indicated the time required to complete the objectives of this research. To continue their work, researchers may compete for grants under the Special Research Grants and National Research Initiative programs for water quality.

WATER QUALITY, IOWA

Mr. WHITTEN. Please provide a description of the work that has been done under the water quality program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not yet been received. Research under this earmarked grant to Iowa State University will be to expand research, started in 1989 with funding from the groundwater research program, on development of practices for management of agricultural chemicals and crop and soil management practices to prevent the movement of potential chemical pollutants from surface run-off through pothole drains in northern Iowa directly to groundwater aquifers.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through FY 1990?

Dr. JORDAN. Beginning in 1990 funds have been earmarked under the Direct Federal Administration program. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $206,000. In 1989 $168,000 was appropriated under the groundwater research program.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at Iowa State University, Ames, Iowa, and at field locations in northern Iowa.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The proposal for fiscal year 1990 research is presently being prepared by the university. The objective of this project will be to develop and investigate new methods of agricultural chemical management, crop and soil management, and crop responses and economics of management systems to prevent direct run-off of agricultural chemicals into aquifers through agricultural drainage wells.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers have not yet indicated the time required to complete the objectives of this research. The research proposal is still being prepared by the university. To continue their work, researchers may compete for grants under the Special Research Grants and National Research Initiative programs for water quality.

UNOBLIGATED BALANCES

Mr. WHITTEN. According to the notes on page 8-14 you show that at the end of fiscal year 1989, $838,228 lapsed at the end of the year. From what account were these funds?

Dr. JORDAN. The State Agriculture Experiment Stations of American Samoa, Micronesia, Northern Mariana Islands and the District of Columbia were not able to meet their matching requirements of $817,798 under the Hatch Act. There was also $20,430 left unobligated in Hatch Act administrative funds.

Mr. WHITTEN. You also show that $275,000 was transferred out of the agency. Where were these funds transferred to and for what purpose?

Dr. JORDAN. According to the Dire Emergency Supplemental Appropriations Act for fiscal year 1989, $275,000 was transferred from the Commodity Credit Corporation to CSRS. These funds were for a grant to the Agricultural Experiment Station at Kansas State University for the purpose of disseminating information to farmers on methods of alleviating drought problems and exploring improved water conservation techniques.

PESTICIDE CLEARANCE

Mr. WHITTEN. In connection with the special grant for pesticide clearance, which you discuss on pages 8-26 and 8-27, you state that because of requirements for re-registration of previously registered pesticides, it is anticipated that the total number of research projects will double to slightly more than 2,000. You go on to state that at the $3 million funding level, approximately 90 projects can be completed per year at an average cost per project of $33,000. Does this mean that you are anticipating a 22 year backlog on re-registration of pesticide compounds?

Dr. JORDAN. The approach we are taking is to enlist help from producers who need the pesticides to assist us in prioritizing the uses for which registrations are needed. With this process we are selecting the most needed pesticide uses for immediate attention in this program. The FIFRA 88 amendments allow nine years to complete the re-registration process. The proposed funding level will make a very significant contribution to the continued availabilty of the most important pesticide uses.

WATER QUALITY

Mr. WHITTEN. In connection with the water quality funding, on page 8-22 you discuss the Midwest Initiative. What universities participate in the Midwest Initiative?

Dr. JORDAN. Of the research proposals selected for funding under the Midwest Initiative for FY 1990, the following universities and State agricultural experiment stations are participating: Iowa State University, University of Minnesota, University of Missouri, University of Nebraska, and Ohio State University, in cooperation with ARS and other scientists both within and outside the Midwest States.

Mr. WHITTEN. How does the special grant to the University of Southern Illinois for water quality work tie in with the Midwest Initiative?

Dr. JORDAN. The research proposal for the special grant to Southern Illinois University has not yet been received, but will involve water quality-related research. This project is not a part of the Midwest Initiative Program. Scientists in the Midwest Initiative-related projects will certainly make use of any research information that may have relevance to the soils, cropping systems, hydrogeology, and climatic factors representative of the conditions on which their research is conducted. One purpose of the Midwest Initiative is to extrapolate their funding to similar conditions elsewhere, so as to transfer the technology developed from their research as widely as possible.

1890 INSTITUTIONS CAPACITY BUILDING GRANTS

Mr. WHITTEN. For fiscal year 1991 you are requesting an increase of $5,570,000 for the 1890 Institutions Capacity Building Grants Program, for a total program of $11 million., You state that beginning in 1991 the program will require a dollar-for-dollar matching funds from non-Federal sources. Have all of the 1890 Institutions and Tuskegee certified to you that they will be able to meet any matching requirements, or have they expressed concern about their abilities to match these funds?

Dr. JORDAN. When the 1890 Institution Capacity Building Grants Program was first discussed with the university community, concern was expressed about their ability to match these funds. Since that time, however, as the universities have learned more about how the program is designed and participated in discussions about the benefits to be gained through the involvement of private industry and their State legislatures, a degree of acceptance has been achieved regarding this matter. In fact, although matching is not required for the FY 1990 program, an informal survey conducted by the Cooperative State Research Service among the 1890 institutions revealed that the institutions are actively seeking such support and that we might expect a sizable proportion of the FY 1990 funds to be matched from non-Federal sources.

HIGHER EDUCATION

Mr. WHITTEN. Under the Higher Education Program you are requesting an increase of $1,184,000, which would be used to support three years of training for approximately 65 doctoral students and 30 masters fellows. How are these individuals selected?

Dr. JORDAN. Under the Food and Agricultural Sciences National Needs Graduate Fellowships Program, grants are awarded to the institutions of higher education which are deemed by the peer review panel to offer the best programs of study and research in the targeted national need areas supported by the program. The colleges and universities receiving the grants then make a special recruitment effort and select the fellows based on their academic achievements. The fellows supported thus far are characterized by absolutely superior intellectual and scholarly competence. The mean Graduate Record Examination score of the USDA fellows supported to date is 1,300—more than 300 points above the average graduate student in agriculture. These fellows, all U.S. citizens, were and are among the top five percent of doctoral students in American universities.

Mr. WHITTEN. What commitments do they make with respect to their future work once they have completed their programs?

Dr. JORDAN. A major factor in evaluating and selecting the USDA National Needs graduate fellows is their demonstration of a genuine commitment to a future career as a food or agricultural scientist or professional. The Fellowships Program supports each master's student for a period of two years and each doctoral student for a period of three years. Of course, USDA recognizes that more time is needed to train a doctoral student and grantee institutions are expected to continue supporting these individuals through such other institutional means as teaching assistantships and research assistantships. The student's major obligation is to maintain satisfactory academic progress during the period of USDA support. Reports from some of the fellows who have completed their USDA support state that they have gone on to pursue more advanced degrees as well as employment with institutions of higher education, the public sector, and the private sector.

CARRYOVER FUNDS

Mr. WHITTEN. According to page 8-64 of the notes, $170,000 was carried over from 1989 to 1990 in the Federal Administration account. What funds were carried over and why?

Dr. JORDAN. CSRS did not use all of the administration funds from the buildings and facilities program. Since this is a no-year program these funds have been carried over from 1989 to 1990 and will be used to provide for site visits, personnel costs, and other items needed to effectively administer the CSRS program.

AGRICULTURAL RELATED RESEARCH

Mr. WHITTEN. In terms of basic research related to agriculture, for fiscal years 1988, 1989, and 1990, how much is funded by CSRS through competitive grants; how much is funded by the National Institutes of Health; how much is funded by the National Science

Foundation; and how much is funded by other agencies of the Federal Government?

Dr. **Jordan**. The appropriation for the CSRS Competitive Research Grants program for the last three years is as follows: Fiscal Year 1988, $42,372,000; Fiscal Year 1989, $39,716,000; and Fiscal Year 1990, $42,521,000. All research conducted under the Competitive Research Grants program is basic research.

Every year the National Science Foundation conducts a survey which is entitled "Federal Funds for Research and Development". Research is broken out into eight broad fields of science, each consisting of a number of detailed fields. The field entitled "Life Sciences" consists of five detailed fields: biological—excluding environmental, environmental biology, agricultural, medical, and life sciences not elsewhere classified. Under the specific category of agricultural research, over 97 percent was funded by USDA.

We will provide tables for the record on Life Sciences Basic Research which have been extracted from the National Science Foundation's "Federal Funds for Research and Development: Fiscal Years 1988, 1989, and 1990."

[The information follows:]

FEDERAL OBLIGATIONS FOR BASIC RESEARCH IN LIFE SCIENCES, BY AGENCY AND DETAILED FIELD OF SCIENCE/ENGINEERING: FISCAL YEAR 1988

(THOUSANDS OF DOLLARS)

AGENCY AND SUBDIVISION	LIFE SCIENCES					
	TOTAL	BIO-LOGICAL	ENVIRON-MENTAL BIOLOGY	AGRI-CULTURAL	MEDICAL	LIFE SCIENCES NEC
TOTAL, ALL AGENCIES	4,501,756	2,414,895	146,763	293,669	1,573,227	73,202
DEPARTMENTS						
DEPARTMENT OF AGRICULTURE, TOTAL	409,468	59,010	51,535	287,091	11,832	-
AGRICULTURAL RESEARCH SERVICE	244,114	14,372	15,693	208,508	5,541	-
COOPERATIVE STATE RESEARCH SERVICE	128,074	31,944	15,357	74,482	6,291	-
FOREST SERVICE	33,179	12,694	20,485	-	-	-
OFF OF INTERNAT'L COOPERATION & DEVELOPMENT	3,563	-	-	3,563	-	-
OFFICE OF TRANSPORTATION	538	-	-	538	-	-
DEPARTMENT OF COMMERCE, TOTAL	-	-	-	-	-	-
BUREAU OF THE CENSUS	-	-	-	-	-	-
DEPARTMENT OF DEFENSE, TOTAL	90,128	40,508	4,092	-	44,808	720
DEPARTMENT OF THE ARMY	44,317	4,740	505	-	39,072	-
DEPARTMENT OF THE NAVY	24,253	17,271	1,663	-	4,599	720
DEPARTMENT OF THE AIR FORCE	10,776	10,497	279	-	-	-
DEFENSE AGENCIES	10,782	8,000	1,645	-	1,137	-
DEPARTMENT OF EDUCATION	1,446	-	-	-	-	1,446
DEPARTMENT OF ENERGY	81,096	75,923	170	395	-	4,608
DEPT OF HLTH & HUMAN SERVICES, TOTAL	3,575,065	2,016,198	639	294	1,495,414	62,520
ALCOHOL, DRUG ABUSE & MENTAL HLTH ADMIN	165,870	107,560	588	294	52,890	4,538
HEALTH RESOURCES AND SERVICES ADMINISTRATION	1,079	-	-	-	1,079	-
NATIONAL INSTITUTES OF HEALTH	3,408,116	1,908,638	51	-	1,441,445	57,982
DEPARTMENT OF THE INTERIOR, TOTAL	4,800	3,396	1,404	-	-	-
US FISH & WILDLIFE SERVICE	4,800	3,396	1,404	-	-	-
DEPARTMENT OF JUSTICE, TOTAL	253	253	-	-	-	-
OFFICE OF JUSTICE PROGRAMS	253	253	-	-	-	-
DEPARTMENT OF THE TREASURY, TOTAL	-	-	-	-	-	-
OFFICE OF PROTECTIVE RESEARCH	-	-	-	-	-	-
DEPARTMENT OF VETERANS AFFAIRS	16,446	1,701	-	-	14,745	-
OTHER AGENCIES						
AGENCY FOR INTERNAT'L DEVELOPMENT	1,952	-	-	1,952	-	-
ENVIRONMENTAL PROTECTION AGENCY	10,605	2,091	3,820	1,611	3,083	-
NATIONAL AERONAUTICS & SPACE ADMIN	27,871	19,108	1,130	692	3,345	3,596
NATIONAL SCIENCE FOUNDATION	252,686	183,667	68,707	-	-	312
SMITHSONIAN INSTITUTION	28,306	13,040	15,266	-	-	-
TENNESSEE VALLEY AUTHORITY	1,634	-	-	1,634	-	-

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

FEDERAL OBLIGATIONS FOR BASIC RESEARCH IN LIFE SCIENCES, BY AGENCY
AND DETAILED FIELD OF SCIENCE/ENGINEERING: FISCAL YEAR 1989 (EST.)
(THOUSANDS OF DOLLARS)

AGENCY AND SUBDIVISION	LIFE SCIENCES					
	TOTAL	BIO-LOGICAL	ENVIRON-MENTAL BIOLOGY	AGRI-CULTURAL	MEDICAL	LIFE SCIENCES NEC
TOTAL, ALL AGENCIES	4,821,643	2,598,677	153,572	300,859	1,688,883	79,652
DEPARTMENTS						
DEPARTMENT OF AGRICULTURE, TOTAL	418,339	58,591	52,204	294,790	12,754	-
AGRICULTURAL RESEARCH SERVICE	255,468	15,350	16,722	217,451	5,945	-
COOPERATIVE STATE RESEARCH SERVICE	126,895	30,351	14,679	75,056	6,809	-
FOREST SERVICE	33,693	12,890	20,803	-	-	-
OFF OF INTERNAT'L COOPERATION & DEVELOPMENT	1,743	-	-	1,743	-	-
OFFICE OF TRANSPORTATION	540	-	-	540	-	-
DEPARTMENT OF COMMERCE, TOTAL	-	-	-	-	-	-
BUREAU OF THE CENSUS	-	-	-	-	-	-
DEPARTMENT OF DEFENSE, TOTAL	92,323	42,554	4,256	-	44,987	526
DEPARTMENT OF THE ARMY	43,877	4,847	517	-	38,513	-
DEPARTMENT OF THE NAVY	26,143	19,117	1,692	-	4,808	526
DEPARTMENT OF THE AIR FORCE	10,332	10,065	267	-	-	-
DEFENSE AGENCIES	11,971	8,525	1,780	-	1,666	-
DEPARTMENT OF EDUCATION	1,480	-	-	-	-	1,480
DEPARTMENT OF ENERGY	91,557	85,440	177	409	-	5,531
DEPT OF HLTH & HUMAN SERVICES, TOTAL	3,847,618	2,170,751	802	380	1,607,736	67,949
ALCOHOL, DRUG ABUSE & MENTAL HLTH ADMIN	197,590	127,149	761	380	63,441	5,859
HEALTH RESOURCES AND SERVICES ADMINISTRATION	947	-	-	-	947	-
NATIONAL INSTITUTES OF HEALTH	3,649,081	2,043,602	41	-	1,543,348	62,090
DEPARTMENT OF THE INTERIOR, TOTAL	4,800	3,355	1,445	-	-	-
US FISH & WILDLIFE SERVICE	4,800	3,355	1,445	-	-	-
DEPARTMENT OF JUSTICE, TOTAL	200	200	-	-	-	-
OFFICE OF JUSTICE PROGRAMS	200	200	-	-	-	-
DEPARTMENT OF THE TREASURY, TOTAL	-	-	-	-	-	-
OFFICE OF PROTECTIVE RESEARCH	-	-	-	-	-	-
DEPARTMENT OF VETERANS AFFAIRS	18,306	1,606	-	-	16,700	-
OTHER AGENCIES						
AGENCY FOR INTERNAT'L DEVELOPMENT	1,410	-	-	1,410	-	-
ENVIRONMENTAL PROTECTION AGENCY	15,360	5,188	5,379	1,641	3,152	-
NATIONAL AERONAUTICS & SPACE ADMIN	32,930	23,094	1,727	735	3,554	3,820
NATIONAL SCIENCE FOUNDATION	266,973	194,261	72,366	-	-	346
SMITHSONIAN INSTITUTION	28,853	13,637	15,216	-	-	-
TENNESSEE VALLEY AUTHORITY	1,494	-	-	1,494	-	-

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

FEDERAL OBLIGATIONS FOR BASIC RESEARCH IN LIFE SCIENCES, BY AGENCY AND DETAILED FIELD OF SCIENCE/ENGINEERING: FISCAL YEAR 1990 (EST.)

(THOUSANDS OF DOLLARS)

AGENCY AND SUBDIVISION	LIFE SCIENCES					
	TOTAL	BIO-LOGICAL	ENVIRON-MENTAL BIOLOGY	AGRI-CULTURAL	MEDICAL	LIFE SCIENCES NEC
TOTAL, ALL AGENCIES	5,199,114	2,812,806	177,682	314,262	1,807,918	86,446
DEPARTMENTS						
DEPARTMENT OF AGRICULTURE, TOTAL	438,542	68,599	55,633	306,107	8,203	-
AGRICULTURAL RESEARCH SERVICE	265,850	15,973	17,401	226,290	6,186	-
COOPERATIVE STATE RESEARCH SERVICE	136,290	39,317	16,754	78,202	2,017	-
FOREST SERVICE	34,787	13,309	21,478	-	-	-
OFF OF INTERNAT'L COOPERATION & DEVELOPMENT	1,301	-	-	1,301	-	-
OFFICE OF TRANSPORTATION	314	-	-	314	-	-
DEPARTMENT OF COMMERCE, TOTAL	-	-	-	-	-	-
BUREAU OF THE CENSUS	-	-	-	-	-	-
DEPARTMENT OF DEFENSE, TOTAL	103,599	47,016	4,053	-	52,197	333
DEPARTMENT OF THE ARMY	53,915	8,134	290	-	45,491	-
DEPARTMENT OF THE NAVY	28,520	20,926	1,955	-	5,306	333
DEPARTMENT OF THE AIR FORCE	11,843	11,537	306	-	-	-
DEFENSE AGENCIES	9,321	6,419	1,502	-	1,400	-
DEPARTMENT OF EDUCATION	1,480	-	-	-	-	1,480
DEPARTMENT OF ENERGY	109,178	101,655	175	407	-	6,941
DEPT OF HLTH & HUMAN SERVICES, TOTAL	4,125,456	2,328,384	960	458	1,722,728	72,926
ALCOHOL, DRUG ABUSE & MENTAL HLTH ADMIN	220,819	142,236	916	458	70,704	6,505
HEALTH RESOURCES AND SERVICES ADMINISTRATION	1,024	-	-	-	1,024	-
NATIONAL INSTITUTES OF HEALTH	3,903,613	2,186,148	44	-	1,651,000	66,421
DEPARTMENT OF THE INTERIOR, TOTAL	4,200	2,800	1,400	-	-	-
US FISH & WILDLIFE SERVICE	4,200	2,800	1,400	-	-	-
DEPARTMENT OF JUSTICE, TOTAL	100	100	-	-	-	-
OFFICE OF JUSTICE PROGRAMS	100	100	-	-	-	-
DEPARTMENT OF THE TREASURY, TOTAL	-	-	-	-	-	-
OFFICE OF PROTECTIVE RESEARCH	-	-	-	-	-	-
DEPARTMENT OF VETERANS AFFAIRS	14,885	1,291	-	-	13,594	-
OTHER AGENCIES						
AGENCY FOR INTERNAT'L DEVELOPMENT	486	-	-	486	-	-
ENVIRONMENTAL PROTECTION AGENCY	27,522	6,682	9,083	4,629	7,128	-
NATIONAL AERONAUTICS & SPACE ADMIN	40,404	29,180	1,940	842	4,068	4,374
NATIONAL SCIENCE FOUNDATION	301,418	212,885	88,141	-	-	392
SMITHSONIAN INSTITUTION	30,511	14,214	16,297	-	-	-
TENNESSEE VALLEY AUTHORITY	1,333	-	-	1,333	-	-

SOURCE: NATIONAL SCIENCE FOUNDATION, SRS

PLANT SCIENCE CENTERS

Mr. WHITTEN. For fiscal year 1990 you requested $3.4 million for the Plant Science Centers. This program was initiated in fiscal year 1988 using existing funds. How much was utilized for Plant Science Centers in fiscal years 1989 and 1990?

Dr. JORDAN. The three agencies—USDA, NSF, and DOE—involved in the Plant Science Centers will complete their commitments to the current projects but not institute new projects. The USDA contribution to the Michigan State University USDA-DOE-NSF Plant Science Center was $500,000 in 1989. This amount represents the USDA's commitment to the project although individual investigator initiated projects are currently being supported on related topics at Michigan State University.

Mr. WHITTEN. How much did the Department of Energy provide and how much did the National Science Foundation provide?

Dr. JORDAN. In 1989 the Department of Energy supported two Plant Science Centers. The University of Georgia received $1,000,000. Arizona State University received $1,200,000. In 1989 the National Science Foundation provided $1,504,714 for the Center at Cornell University.

Mr. WHITTEN. Do you plan to provide additional funding for these Centers or additional Centers during fiscal year 1991?

Dr. JORDAN. No additional money is available to support the Plant Science Center at Michigan State University. Individual investigator initiated projects from Michigan State University have been successful in obtaining funds on related topics, however.

Mr. WHITTEN. What are the plans of the National Science Foundation and the Department of Energy during fiscal years 1990 and 1991?

Dr. JORDAN. The Department of Energy and the National Science Foundation will complete their commitment to ongoing Plant Science Centers awardees. No additional awards are contemplated. The National Science Foundation has begun a new program, the Science and Technology Center. Some of the applicants have included projects that are comparable to the Plant Science Center program.

RANGELAND RESEARCH

Mr. WHITTEN. For fiscal years 1989 and 1990, $475,000 was appropriated for rangeland research. How are the fiscal year 1989 funds being used, and where is the work being carried out?

Dr. JORDAN. Eight grants were awarded in 1989 to universities in Colorado, Oregon, South Dakota, Texas, and Utah. The funds were awarded in the large spectrum of research issues that may be addressed to assure that the nation's rangelands remain productive as watersheds and as the major food source for wildlife and livestock.

Mr. WHITTEN. Please give the Committee some examples of what has been accomplished or what has been learned as a result of this research, which has now been funded for several years.

Dr. JORDAN. One continuing study has as an objective the training of sheep to specific diets. Lambs are introduced to a variety of plants not normally those selected by free ranging animals. The study has determined that the trained lambs will feed on those selected plants; and that when they become ewes, they will train their offspring to do the same. The implications for range management are significant. The study has been continued with a goal of training animals to graze in areas other than the riparian grasslands.

Another completed study has examined the uncertainty concerning cattle prices and forage yields by using statistical techniques to maximize net ranch income. This study devises strategies regarding cow-calf and stocker operations to be considered by the rancher.

Also, the effect of mycorrhizal fungi on selected rangeland grasses was determined. Grasses inoculated with these beneficial fungi competed more successfully with noxious plants than did the untreated controls. Treated plants also maintained better water efficiency. Results indicate restoration of disturbed range with mycorrhizal treated plants will provide better establishment in grasses that can successfully compete with weeds.

Shrubs are a major component of the range vegetation. A completed study has identified candidates for revegetation of severely eroded and degraded range which are tenacious and which provide winter feed for wildlife and livestock.

Basic studies into the insect-plant interactions have isolated insects that may provide control of noxious weeds that have invaded rangelands. While such studies are continuing, the researchers are optimistic that insects may be used in place of herbicides thus reducing costs to the rancher and increasing the desirable species of grasses used by animals. Additional work into the allelopathy exhibited by competing plants has identified the precursor of the active ingredient that retards and restricts the growth of a gregarious weed found throught the western range.

Mr. WHITTEN. During fiscal year 1989, to what institutions were these grants distributed, in what amounts, and for what types of work?

Dr. JORDAN. The recipients, amount, and title of the grants awarded were as follows: Colorado State University, $72,000, "Water Quantity and Quality as Affected by Grazing in a Mountainous Riparian Zone"; Oregon State University, $25,000, "Reliability of Weed Control by Exotic Insects"; South Dakota State University, $56,991, "Optimizing Diet Quality for Cattle Grazing Native Grasses and Introduced Grass Pasture"; Texas A&M University, $55,000, "Dissemination of Seed by Cattle: Potentials for Rangelands Revegetation"; Texas A&M University, $34,000, "Molecular Probe for Drought Stress in Native Species"; Texas A&M University, $72,000, "Succession on Mixed Shrublands: Reconstructing the Past and Predicting the Future"; Texas A&I University, $68,000, "Physiological Responses of Shrub Seedlings to Nurse Plant Microenvironments"; and Utah State University, $72,000, "Reducing Damage to Riparian Habitats by Cattle Through Social Learning." The first and last studies deal with the stream-range interface. Other studies deal with range ecology, range plant-animal interactions, and control of weeds through biological agents.

Mr. WHITTEN. What are the plans for the fiscal year 1990 program?

Dr. JORDAN. The closing date for FY 1990 competitive grant proposals was February 5, 1990. Sixty-four proposals have been received, and a peer panel chosen. A meeting of the peer panel to evaluate the proposals and recommend those to be funded will be held the third week of April, 1990. It is estimated that six grants will be awarded.

AQUACULTURE CENTERS

Mr. WHITTEN. For fiscal year 1990, $3,750,000 was provided for the Aquaculture Centers. Please describe for the Committee each of the Centers and how the funds are being used in fiscal years 1989 and 1990.

Dr. JORDAN. In fiscal years 1989 and 1990 grants were made for the operation of five regional aquaculture centers. The centers are administered through Mississippi State University, the University of Washington, Southeastern Massachusetts University, the University of Hawaii and The Oceanic Institute in a joint effort, and Michigan State University and Iowa State University, also in a joint effort. All five centers are operational with administrative structures consisting of a board of directors, an industry advisory council, and a technical committee. Coordination at the national level is carried out through a national coordinating council.

Regional priorities for research and extension programs have been established with strong input from the aquaculture industry. Multi-state collaborative projects have been developed and initiated utilizing the best research and extension personnel available in each region. Projects address important issues in the aquaculture industry such as marketing, aquatic animal health, genetics, nutrition, reproduction and a wide variety of extension educational programs.

Mr. WHITTEN. What did each of the Centers charge for administrative costs in fiscal year 1989?

Dr. JORDAN. The authorization for these centers prohibits the charging of indirect costs or overhead. Direct administrative costs for project development and implementation in 1989, based on the percent of the total amount awarded to each center, is as follows: 15 percent for the Southern Regional Center, 10 percent for the Western Regional Center, 14 percent for the Northeastern Regional Center, 17 percent for the Tropical and Subtropical Regional Center, and 20 percent for the North Central Regional Center.

LOW-INPUT SUBSTAINABLE AGRICULTURE

Mr. WHITTEN. For low-input agriculture, $3,900,000 was provided in fiscal year 1988 and $4,450,000 was provided in fiscal years 1989 and 1990. How and where are these funds being used?

Dr. JORDAN. These funds are being used to support research and education projects designed to provide farmers and others with reliable, practical information on sustainable farming opportunities and practices. Project proposals are submitted by private and public organizations, including farmers. Proposals are reviewed and approved for funding in each of the four U.S. regions. During its first two years, the program provided support to about 14 percent of the proposals received.

Total support for approved projects includes LISA program funding and matching support, such as in-kind contributions, salaries, and indirect costs. In FY 1988, total funds of about $850,000 were allocated to each of the four regions, including roughly $800,000 for projects and $50,000 for administrative costs. Matching support for all regions was approximately $3.6 million. For FY 89 and in FY 90, LISA funds allocated to each region totalled about $975,000, including $910,000 for projects.

LISA projects now being supported include research on the physical and economic feasibility of different crop and livestock farming approaches and specific practices with potential for enhancing the sustainability of agriculture, as well as educational projects to take information directly to farmers and to improve the information delivery capability.

I will provide a table for the record which shows the numbers of proposals received and approved for support in FY 1988 and 1989.

[The information follows:]

Region	1988 proposals		1989 proposals	
	Submitted	Funded	Submitted	Funded [2]
Northeast	78	11	51	15 (8)
North Central	106	21	127	17 (4)
South	120	11	110	13 (8)
West	67	10	[1] 143	11 (9)
Total	371	53	431	56 (29)

[1] The West used a "preproposal procedure" in 1989, inviting abbreviated preproposals as the first step. Of the 143 preproposals received, 30 were approved for development of detailed proposals.

[2] Includes projects approved in FY 88 and selected to receive support in FY 89, as well as new projects (shown in parentheses).

Mr. Whitten. For fiscal year 1990 you proposed to terminate this work, but for fiscal year 1991 you propose it be funded. What changed your mind with regard to low-input agricultural research?

Dr. Jordan. Further review of the Low Input Sustainable Agriculture—LISA—program indicated that it would be a valuable component of the Department's overall efforts on sustainable agriculture. This program attracts participation from non-traditional USDA cooperators who have important information to offer.

GULF COAST SHRIMP RESEARCH

Mr. Whitten. Would you please update the committee on the status of the Gulf Coast Shrimp aquaculture research project?

Dr. Jordan. In fiscal year 1989, studies were conducted on growout intensification, prevention and detection of diseases, seed production, and feeds. A commercial prototype production system was developed and performance trials were conducted. Extremely high production levels have been obtained in these systems. Maturation and reproductive performance in seed production systems is approaching commercial feasibility. Additionally, protocols for viral detection have been established.

In fiscal year 1990, research will continue in the areas of intensificiation, maturation and spawning, larval rearing, use of monoclonal antibodies for rapid detection of viral infections, water quality and pond dynamics. Additional emphasis will be placed on development of specific pathogen free broodstock and seed.

Mr. WHITTEN. Please describe for the Committee the various locations that are involved in this research project and what role they play within the overall project?

Dr. JORDAN. In fiscal years 1989 and 1990 grants were awarded to the Oceanic Institute, Hawaii and the Gulf Coast Research Laboratory in Mississippi. In addition, research is conducted through subcontracts at the University of Southern Mississippi, Tufts University, the Waddell Mariculture Center in South Carolina, the Texas Agricultural Experiment Station, and the University of Arizona.

SUPPLEMENTAL AND ALTERNATIVE CROPS

Mr. WHITTEN. Would you please describe for the Committee the work being carried out under the supplemental and alternative crops program for fiscal year 1989 and the plans for fiscal year 1990?

Dr. JORDAN. The Supplemental and Alternative Crops program was funded for $321,000 in FY 1990, compared with $1,025,000 in FY 1989. The reduced funding level resulted from shifts of some projects to the special research grants program such as oilseeds, North Dakota and oil from jojoba, New Mexico as well as a hiatus for program planning for the mesquite research project in Texas.

The crambe/rapeseed program involves eight states, the Kansas Board of Agriculture, and private firms. USDA has entered a partnership with a private firm to conduct independent third party tests of the firm's new lubricant. In addition, efforts are underway to develop plastic, nylons, elastomers, and paints and coatings from crambe/rapeseed oil. Improvements in crop production to increase yield and economic returns also are underway. Research indicates opportunities exist to improve removal of the oil from the seed and to feed the high protein meal to animals. A private firm bought and processed over 315,000 pounds of crambe seeds in 1989 and successfully sold the oil and meal from this pilot-scale commercial run.

Mr. WHITTEN. You are proposing to fund guayule under this authorization rather than under Critical Agricultural Materials. What is the rationale for changing the authorization under which this work is carried out?

Dr. JORDAN. Guayule research can be conducted under the Supplemental and Alternative crops provision of the 1985 Food Security Act. The Critical Agricultural Materials Commercialization and Economic Development Act of 1984 has expired.

SPECIAL GRANTS

ACID PRECIPITATION

Mr. WHITTEN. Please provide a description of the work that has been done under the acid precipitation program to date and the period of the existing contract.

Dr. JORDAN. The fiscal year 1990 Acid Precipitation Special Research Grants announcement is in final stages of development in CSRS. We expect this year's program to continue emphasis on crops and cropping systems, with some work to be done with forest tree species. Research grants awarded in fiscal year 1989 terminate between June 1991 and June 1992.

Mr. Whitten. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. Jordan. Grants have been awarded from special research grant funds appropriated as follows: FY 1983–1984, $695,000 per year; FY 1987–1989, $661,000 per year; FY 1990, $653,000. Grants for acid precipitation research were funded under the Competitive Research Grants program in FY 1985 for $695,000 and FY 1986 for $661,000. A total of $5,382,000 has been appropriated.

Mr. Whitten. Where is this work being carried out?

Dr. Jordan. The fiscal year 1989 grants were awarded to the University of California-Riverside, University of Illinois, Michigan Technological University, North Carolina State University, Rutgers University and Virginia Polytechnic Institute and State University.

Mr. Whitten. What has been accomplished to date?

Dr. Jordan. The fiscal year 1989 program will continue to emphasize the effects of acidic depositions and gaseous pollutants, alone or in combination, on crops and cropping systems. Forestry proposals were accepted if they clearly dealt with national priorities as outlined in the grant announcement. Early results of studies on acidic fog effects on conifer tree species show that exposure of tree needles results in disruption of the waxy layer of needles. It appears that such responses may make the needles more vulnerable to ozone penetration and damage. Different varieties of soybean, snap bean and quaking aspen are affected differentially at common ozone and acid rain pH levels, indicating genetic basis for plant response. Antioxidant materials applied to plants protect a wide variety of germplasm against ozone damage.

Mr. Whitten. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. Jordan. This project has been managed as a support program for the national assessment of acid precipitation effects on terrestrial systems. This program also expands the effects component of the National Atmospheric Deposition Program, Hatch Interregional Project IR–7, which is slated for review in 1992 for a decision as to termination or extension of the project. We expect to fund related follow-up research with support from the global change special research grants program.

AFLATOXIN RESEARCH, ILLINOIS

Mr. Whitten. Please provide a description of the work that has been done under the aflatoxin research program to date and the period of the existing contract.

Dr. Jordan. CSRS has requested the university to submit a grant proposal that has not yet been received.

Mr. Whitten. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. Jordan. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $87,000.

Mr. Whitten. Where is this work being carried out?

Dr. Jordan. Research will be conducted at the University of Illinois.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The effects of selected storage molds—mainly aflatoxin—on grain and feed quality will be determined in certain experiments. Other studies will cover microbiological and biochemical factors in occurrence and level of production of aflatoxin under controlled environment conditions. New ways to prevent or mitigate toxin production are expected results of this project.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the work may be completed in fiscal year 1995.

AGRICULTURAL DIVERSIFICATION AND SPECIALTY CROPS, HAWAII

Mr. WHITTEN. Please provide a description of the work that has been done to date and the period of the existing contract under the program for agricultural diversification and specialty crops in Hawaii.

Dr. JORDAN. This research focused on identifying the steps necessary to further develop a small industry that has considerable potential—taro. Working with producers and processors, several new product forms have been indentified for development: poi taro grown under a nontraditional dryland system; gums as a high value end product; and taro chips. The development of this industry is a model for further expansion for development of diversified agriculture in Hawaii. The fiscal year 1989 grant supports research through March 1990. The fiscal year 1990 continuation grant proposal has been requested by CSRS from the University of Hawaii but not yet received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1988 and 1989—$156,000 per year; fiscal year 1990—$154,000. A total of $466,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Hawaii's Institute of Tropical Agriculture and Human Resources.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The University of Hawaii established an advisory group consisting of representatives from public and private institutions. The advisory group is outlining new directions for agricultural diversification, in particular, for specific steps to be taken by private businesses, university scientists, and state government to achieve expansion of the taro chip industry. The group is also involved in planning longer term diversification projects for exportable tropical fruits and in exploring the potential and requirements for Chinese tallow tree development.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that research could be completed in 1992.

AGRICULTURAL TRADE, NORTH DAKOTA

Mr. **Whitten**. Please provide a description of the work that has been done under the agricultural trade program to date and the period of the existing contract.

Dr. **Jordan**. The North Dakota agricultural trade program has the objective of addressing international trade and marketing issues affecting the exporting of durum wheat, barley, and oilseeds. The program is being staffed and three projects have been initiated. Additional projects are being planned to fulfill the project objectives. The fiscal year 1989 grant supports research through December 1993.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 appropriation for fiscal year 1989 was $600,000 and the fiscal year 1990 appropriation is $592,000. A total of $1,192,000 has been appropriated.

Mr. **Whitten**. Where is the work being carried out?

Dr. **Jordan**. The research is being carried out at the North Dakota Agricultural Experiment Station.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The purpose of the program is to identify marketing problems that prevent realizing the full potential for exports of durum wheat, barley and oilseeds from the Northern Great Plants region. Staffing has been nearly completed and three research projects initiated. One project addresses the sensitivity of exports to wheat prices. A second project examines the effectiveness of various export enhancement instruments, and a third is assessing the effects on durum wheat markets from implementation of the U.S.-Canada Free Trade Agreement. Other projects are being developed to fulfill the objectives of the project.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The researchers at North Dakota State University anticipate that this stage of the agricultural trade project should be completed in 1993.

AGRICULTURAL UTILIZATION, MINNESOTA

Mr. **Whitten**. Please provide a description of the work that has been done under the agricultural utilization program to date and the period of the existing contract.

Dr. **Jordan**. Minnesota funded nine research areas evaluating market opportunities and potential new uses of agricultural products. These areas included research on exporting soybean meal pellets and converting sugars in agricultural wastes into highway deicing salts, among others. The fiscal year 1989 grant supports this research through February 1991. A proposal for the fiscal year 1990 funds has recently been received from Minnesota requesting funding through September 1991.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated for fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 with an appropriation of $200,000. The fiscal year 1990 appropriation is $395,000. A total of $595,000 has been appropriated.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. Most of the research is being conducted at the University of Minnesota. One project is being conducted at Southwest State University in Marshall, Minnesota.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Progress has been reported in eight project areas. One project was cancelled and will be replaced by another. The projects will focus on utilizing the identified new technologies to develop new uses for Minnesota agricultural commodities.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial grant proposal, submitted in 1989, indicated work should be completed in 2 years.

ALTERNATIVE CROPPING SYSTEMS IN THE SOUTHEAST

Mr. WHITTEN. Please provide a description of the work that has been done under the alternative croping systems program to data and the period of the existing contract.

Dr. JORDAN. The South Carolina, North Carolina, and Georgia Agricultural Experiment Stations have collaborated, in a joint research project, to study the economic and biological feasibility of expanded production of horticultural crops in the southeastern United States, either as a complement to or as a substitute for crops currently produced. They have identified a number of vegetable crops which have potential for expansion, increased yields, and/or alterative marketing procedures, including international markets. They have made a series of recommendations for the production of these crops. The fiscal year 1989 grant extends through February 1991. CSRS has requested the South Carolina Agricultural Experiment Station to submit a grant proposal for fiscal year 1990 that has not yet been received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1985, $300,000; FY 1986-1989, $285,000 per year; FY 1990, $281,000. A total of $1,721,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the South Carolina, North Carolina, and Georgia State Agricultural Experiment Stations.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. This research has resulted in recommendations for sequential cropping for over 15 different vegetables including sweet corn, tomatoes, and several leafy vegetable species using different dates and rates of planting, different fertilizer application rates, and various irrigation schedules, to obtain optimum yields. Models have been developed and several new marketing "windows," when non-traditional crops can be grown for maximum profit, have been found.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. This project was originally set up as a two phase project. The initial proposal indicated a five-year time period would be required to complete the first phase of this project. In order to complete phase two, it is anticipated that the work may be completed in fiscal year 1994.

ALTERNATIVE CROPS, NORTH DAKOTA

Mr. **Whitten**. Please provide a description of the work that has been done under the alternative crops program to date and the period of the existing contract.

Dr. **Jordan**. The fiscal year 1989 agreement supports research, development, and commercialization through October 1992. CSRS has requested the university to submit a grant proposal for fiscal year 1990. It is currently being prepared at North Dakota State University.

The work is divided into crop production and crop utilization work. The major crops being evaluated include crambe, industrial rapeseed, flax, amaranth, lupines, safflower, and lentils. Intercropping is being researched as one means to improve returns for farmers. Insect, weed, and fertility studies are also underway at several sites. The utilization work is focused on commercialization of a red dye from the purple-seeded sunflower, development of a natural anti-oxidant, impact of flax in human diets in terms of health improvement, development of a perfume base from crambe, and commercialization of paints, coatings, and elastomers from derivatives of crambe oil. Progress has been made including developing interest from the private sector in commercializing products.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1988. The appropriation in fiscal years 1988 and 1989 was $500,000 each year under the Supplemental and Alternative Crops program. The fiscal year 1990 funding of $494,000 is authorized under the Special Research Grants program. A total of $1,494,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. North Dakota State University conducts the work.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The red dye project has advanced to the point where a private firm has provided funds for equipment to scale up the development; the firm has indicated interest in investing $250,000 in pilot plant development if the current work is successful. Several major paint manufacturers have indicated interest in the paints and coatings work. Elastomers with excellent flexibility have been produced in the laboratory. A perfume base has been produced in the laboratory from a derivative of crambe oil. Private sector interest in the natural antioxidant exists. A North Dakota oilseed crushing firm has indicated interest in crushing crambe seed and local farmers have expressed interest in growing the crop. A meeting to orchestrate a demonstration project to grow crambe, crush it, and sell the oil was held on March 2, 1990.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. Much has been accomplished. However, even on the most advanced project, red dye, several more years of effort are required before the commercial sector will proceed by investing alone in the technology. The number of years varies with the crops and products under investigation.

ALTERNATIVE TO DINOSEB, OREGON

Mr. **Whitten**. Please provide a description of the work that has been done under the alternative to dinoseb program to date and the period of the existing contract.

Dr. **Jordan**. The fiscal year 1989 grant supports research through April 1990. Various weed control practices are being researched as alternatives for dinoseb in snapbeans, peas, caneberries, Willamette Valley wheat, and small-seeded legumes within the Pacific Northwest. In addition, pesticide residue analyses for establishing national tolerances using IR-4 guidelines are being conducted. Sufficient data has been generated this past year to support the registration of caneberries.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $150,000. The fiscal year 1990 appropriation is $222,000. A total of $372,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research is being conducted at Oregon State University with some research planned at Washington State University.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. Alternative herbicides and their residues have been evaluated on the following crops: snapbeans, caneberries, wheat and small-seeded legumes. In addition to the data for caneberries noted above, they expect sufficient data for possible registration for several other herbicide alternatives to dinoseb within the next several years.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The President's budget proposes a $1 million increase in funding for the pesticide clearance special research grant program. Additional registration needs for alternatives to Dinoseb can be developed through that program.

ALTERNATIVE PEST CONTROL, ARKANSAS

Mr. **Whitten**. Please provide a description of the work that has been done under the alternative pest control program to date and the period of the existing contract.

Dr. **Jordan**. A multidisciplinary research center was established by the Arkansas Agricultural Experiment Station in fiscal year 1989 to develop biological alternatives to present methods of pest control. Center objectives are to explore, evaluate, and develop biological alternatives to synthetic chemical pesticides for control of agricultural and urban pests including weeds, insects, plant diseases and nematodes and to integrate effective alternative pest controls into agricultural production systems and assess their environmental impact. Research addressing these objectives is well underway.

The fiscal year 1989 grant supports research through April 1990. We expect to award the fiscal year 1990 renewal prior to May 1990.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989, effective date May 1, 1989. The appropriation for fiscal year 1989 was $1,400,000. The fiscal year 1990 appropriation is $1,382,000. A total of $2,782,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Arkansas.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. A collection of biological control candidates for weeds, insects, and diseases of soybean and wheat has been amassed. These will be evaluated for potential as alternative pest control agents. During the current year five fungal pathogens showed sufficient potential to justify thorough evaluations as bioherbicides. Genetic and transformation studies suggest that pathogens of weeds can be genetically improved to ensure stability, safety and improve efficacy. Rice and sunflower accessions have shown allopathic activity against a variety of weed pests in rice and cotton and soybean, respectively. Several viruses and bacterial formulations were shown to persist well in the field and provide adequate control of lepidopterous pests. An introduced lady beetle was found to complement native lady beetles in control of aphids. Several microorganisms applied as seed treatments were effective in reducing the incidence of wheat seedling diseases. Cotton and soybean development studies are underway to identify windows most applicable for the use of alternative pest controls. Monitoring the mobility and persistence of pesticides is yielding information that will allow evaluation of the environmental impact of alternative pest control measures.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The current proposal indicates research should be completed in FY 1993.

ANIMAL HEALTH RESEARCH

Mr. WHITTEN. Please provide a description of the work that has been done under the animal health program to date and the period of the existing contract.

Dr. JORDAN. Research conducted with Animal Health Special Research Grants has focused on the solutions of animal health problems as identified by the Animal Health Science Research Advisory Board. This research is developing and refining methods to protect animal health and prevent or reduce animal disease losses due to infectious and noninfectious diseases and parasites in livestock, poultry and major aquaculture species. Preventive measures and implementable health management systems are being developed to assist producers in eliminating or reducing major animal disease losses and to provide animal products which are competitive in world markets. Additional emphasis is on improving the quality and safety of the animal food chain. Awards made in fiscal year 1990 will support projected research for periods up to 5 years. The fiscal year 1990 deadline for submission of proposals was February 26, 1990. The proposals will be evaluated by peer panels and final selection of those to be funded is expected to be completed by June 1990.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990.

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1979, $10,000,000; fiscal year 1980, $7,000,000; fiscal year 1981, $5,050,000; fiscal years 1982-1984, $7,156,000 per year; fiscal year 1985, $6,000,000; fiscal years 1986-1989 $5,705,000 per year; fiscal year 1990, $5,633,000. A total of $77,971,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted in the State Agricultural Experiment Stations, the colleges and schools of veterinary medicine, and in other cooperating colleges and universities having animal health expertise.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Accomplishments include the development of DNA probes to detect pathogens such as Salmonella, Campylobacter, pseudorabies virus, bluetongue virus and anaplasma. This new technology has markedly expanded diagnostic capabilities and the ability to study the epidemiology and pathogenesis of economically important livestock diseases. Significant progress has been made on specific diagnostic methods for Johnes' disease, brucellosis, retrovirus infections, chlamydiosis and diseases of catfish.

Utilizing the newest biotechnological tools, markedly improved and effective vaccines for pseudorabies and pasteurellosis have been developed. Important studies are continuing on better vaccines for many diseases in cattle, sheep, and poultry. In anaplasmosis research, the development of a genetically engineered subunit antigen is a significant milestone toward improved diagnostic methods and effective vaccines.

Improved tests have been developed for pesticides, drugs, and microbial pathogens, e.g. Salmonella, Listeria, and Campylobacter, to provide surveillance of animals and animal products in the human and animal food chains. Specific advances have been made in clarifying the causes of enteric, respiratory and reproductive diseases in food animals and determining the complex mechanisms involved in resistance and immune response in these diseases. In basic research on cattle, identification of the genes for interferon production and action has been a major accomplishment in the study of resistance to disease. This information will lead to the development of improved prevention and control procedures in the future.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. No additional funding is being requested for animal health research under the Special Research Grants program in fiscal year 1991. Research formerly conducted under this program will be continued under an expanded animal systems component in the National Research Initiative.

ANIMAL SCIENCE FOOD SAFETY CONSORTIUM

Mr. **Whitten**. Please provide a description of the work that has been done under the animal science food safety consortium program to date and the period of the existing contract.

Dr. **Jordan**. The research goal is to enhance the safety of red meat and poultry products of human consumption. There are four objectives: develop rapid detection techniques of pathogenic organisms and toxic chemicals for use in the red meat and poultry production-marketing system; develop a statistical framework from which to develop tolerance levels for these hazardous substances; identify effective interdiction points and develop methods to prevent or reduce substance presence; and develop monitoring techniques and methodologies to detect and estimate the human health risk of these contaminants. The fiscal year 1989 grants support research through June 1990. The consortium's members have been asked to submit proposals for the fiscal year 1990 grants.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by these grants began in fiscal year 1989 and the appropriation for fiscal year 1989 was $1,400,000. The fiscal year 1990 appropriation is $1,678,000. A total of $3,078,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research is being conducted by a consortium composed of the University of Arkansas at Fayetteville, the University of Arkansas for Medical Sciences at Little Rock, Kansas State University, and Iowa State University.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The consortium has organized advisory and technical committees to advise on research planning and provide technical advice to the research staff. The committees consist of scholars, agribusinessmen, and public officials from Federal research and regulatory agencies.

The University of Arkansas is conducting six projects including the development of fast detection methods and assessment of techniques to remove the presence of pathogens in poultry. DNA probes and monoclonal antibodies are being researched for use as detectors. Lactic acid in chiller water and electrical stimulation are being tested for their effectiveness in reducing pathogenic organisms.

Iowa State is conducting nine projects pertaining to swine. These studies include developing methods to detect *Escherichia coli*, a common pathogen, aflatoxins, and several other toxins. Work is being done to find antibodies against *Toxoplasma gondii* and detect the presence of viruses in contaminated port. Work is being initiated on assessing the effect of packaging atmospheres on bacterial contamina in port products and the use of muamic acid to control bacterial contamination. A bibliography on economics of pork product safety was completed to lay the bases for determining needed risk assessment and animal health management studies.

Kansas State has initiated seven projects on beef. Research includes microbial quality of air in abattoir facilities, identifying and classifying pathogens contaminating beef, and developing fast detection probes and treatments to lower the level of microbiological contaminants.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The characteristics of this research and demands for results from this research preclude establishing a precise termination date.

APPLE QUALITY RESEARCH, MICHIGAN

Mr. WHITTEN. Please provide a description of the work that has been done under the apple quality research program to date and the period of the existing contract.

Dr. JORDAN. Factors affecting apple quality, including surface color, shape, ripeness, firmness, texture, flavor, sugar to acid ratio, and blemishes and bruises have been evaluated. The fiscal year 1989 grant extends through June 1990. CSRS has requested a grant proposal for fiscal year 1990 that has not yet been received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1986–1989, $95,000 per year; fiscal year 1990, $94,000. A total of $474,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Michigan Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research on handling, storage, and transportation procedures has resulted in a better understanding of the physical and environmental factors which influence the harvesting, handling, and storage of apples. Recommendations have been made and techniques developed to reduce bruise damage due to production, handling, storage, packing, and distribution techniques.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial proposal indicated a six-year time period would be required to complete this project. It is now anticipated that the work may be completed in fiscal year 1994.

AQUACULTURE RESEARCH

Mr. WHITTEN. Please provide a description of the work that has been done under the aquaculture program to date and the period of the existing contract.

Dr. JORDAN. Included in the program are studies to improve production efficiency through disease and parasite control, genetics, and breeding. Research under grants awarded in fiscal year 1989 extends through June, 1993. In Fiscal Year 1990, deadline for submission of competitive proposals was February 26, 1990. The proposals will be evaluated by a peer panel and final selection of proposals is expected to be completed by May. In Fiscal Year 1989, Congress earmarked $200,000 for research on crawfish and redfish in Louisiana. This research was initiated June 1, 1989 and extends through November, 1990. In addition in Fiscal Year 1989, Congress earmarked $175,000 for hybrid/striped bass research in Maryland.

This research will be supported through February 1991. The Fiscal Year 1990 grant for the crawfish and redfish program will be awarded upon submission and review of the proposal.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1981, $500,000; FY 1982–1985, $518,000 per year; FY 1986, $285,000; FY 1987, $485,000; FY 1988, $660,000; FY 1989, $520,000; FY 1990, $563,000. A total of $5,085,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. In Fiscal Year 1989 grants were awarded to Louisiana, Maryland, Minnesota and Mississippi.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. These studies have led to a better understanding of artificial methods to control reproduction of several commercially important species including trout, catfish and sturgeon. Several disease and fish health problems affecting the industry have been studied as well as methods to improve detection and diagnosis of diseases of catfish, trout, and other salmonids. Techniques for the production of polyploid catfish and trout have been developed in order to genetically improve aquaculture stocks. Research at Louisiana State University has led to improved production efficiency for the commercial culture of crawfish and improved control of redfish production.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be finished?

Dr. JORDAN. Aquaculture continues to grow in importance to American agriculture and research can be supported under the animal systems component of the National Research Initiative.

AQUACULTURE RESEARCH, STONEVILLE, MISSISSIPPI

Mr. WHITTEN. Please provide a description of the work that has been done under the aquaculture research in Stoneville, Mississippi to date and the period of the existing contract.

Dr. JORDAN. The primary objectives of this research have been to improve practical feeds and feeding regimes, to evaluate production management strategies, to determine the causes of off-flavor in channel catfish and develop treatments to reduce the incidence of off-flavor in ponds, and to develop technologies for the production of redfish. The fiscal year 1989 research grant extends through June 1991. The fiscal year 1990 grant will be awarded upon submission and review of the proposal, supporting this research through June 1, 1992.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1980–1981, $150,000 per year; FY 1982, $240,000; FY 1983–1984, $270,000 per year; FY 1985, $420,000; FY 1986–1987, $400,000 per year; FY 1988, $500,000; FY 1989, $588,000; FY 1990, $581,000. A total of $3,969,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The grants have been awarded to the Mississippi Agricultural Experiment Station. Except for research on redfish conducted at the Coastal Aquaculture Unit in Gulfport, Mississippi, all research is conducted at the Delta Branch Experiment Station, Stoneville, Mississippi.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Highly sensitive techniques have been developed to detect off-flavor in tissue of channel catfish and in pond water samples. Development of these techniques has led to a better understanding of the causes and possible treatments for off-flavor in farm-raised catfish. Research on production stocking strategies and broodstock management has improved production efficiency in the industry. Research in the area of nutrition has enhanced the development of practical diets and feeding strategies. Oxygen dynamics in catfish ponds, alternatives to fish meal in commercial catfish diets, and production strategies for redfish have also been evaluated. Ongoing studies are addressing off-flavor in catfish and improved production strategies for redfish.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Aquaculture research can be supported under the animal systems component of the National Research Initiative.

ASPARAGUS YIELD DECLINE, MICHIGAN

Mr. WHITTEN. Please provide a description of the work that has been done under the asparagus yield decline program to date and the period of the existing contract.

Dr. JORDAN. The embryogenesis portion of the project is complete, and a protocol for producing somatic, embryo-derived asparagus plants has been developed. Research on asparagus protoplasts is continuing to develop techniques that will improve plating efficiency and preparing protoplasts for subsequent fusions with resistant species. Cruciferous cover crops were evaluated for suitability in managing populations of the *Fusarium* pathogen. The fiscal year 1989 grant supports this research through March, 1990. The grant for fiscal year 1990 has been received and is under agency review.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: $100,000 per year in fiscal years 1984 and 1985; $95,000 per year in fiscal years 1986 through 1989; $94,000 in fiscal year 1990. A total of $674,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Michigan Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. To date, 340 somatic embryo-derived liner plants have been planted into the field. The basis for mass production is available. Protoclones derived for "Jersey Giant" and somaclones from "Lucullus" show a fairly normal distribution in their susceptibility to both *Fusarium* species. Five percent of the most resistant somaclones and protoclones are being retained for further screening. Protoplasts have been successfully isolated from "Lucullus 234" and "Jersey Giant". The soil will be assayed for the level of

Fusarium and asparagus planted as a bioassay crop. The field will be replanted to asparagus in 1991. In 1990 emphasis will be to confirm the *Fusarium* resistance that has been identified and develop techniques for incorporating this resistance into clones for field testing or into an already horticulturally acceptable asparagus cultivar. In addition, the utilization of cover crops and mycorrhizal fungi in a production system that enhances *Fusarium* tolerance will be pursued.

Mr. **WHITTEN**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **JORDAN**. It is anticipated that additional support should not be required after fiscal year 1990.

BEAN AND BEET RESEARCH, MICHIGAN

Mr. **WHITTEN**. Please provide a description of the work that has been done under the bean and beet research program to date and the period of the existing contract.

Dr. **JORDAN**. The research conducted to date has enabled researchers to determine the agronomic limitations to lowered production costs, to determine the extent of dry bean losses under different harvesting methods, to evaluate the integration of forage legumes into economically efficient cropping systems for dry beans and sugar beets, to breed navy and pinto beans for drought stress tolerance, and to quantify root development and functional efficiencies of sugar beets. The fiscal year 1989 grant runs through April 1990. CSRS has requested the Michigan Agricultural Experiment Station to submit a grant proposal for fiscal year 1990 that has not yet been received.

Mr. **WHITTEN**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **JORDAN**. Grants have been awarded from funds appropriated as follows: FY 1978, $45,000; FY 1979-1980, $50,000 per year; FY 1981, $75,000; FY 1982, $82,000; FY 1983-1985, $97,000 per year; FY 1986-1988, $93,000 per year; FY 1989, $190,000; FY 1990, $188,000. A total of $1,250,000 has been appropriated.

Mr. **WHITTEN**. Where is this work being carried out?

Dr. **JORDAN**. This research is being conducted by the Michigan State Agricultural Experiment Station.

Mr. **WHITTEN**. What has been accomplished to date?

Dr. **JORDAN**. Research to date has resulted in an understanding of the factors that influence the growth of high yielding, high quality edible dry beans and sugar beets. Optimal crop and soil management systems have been developed, taking into account drought stress, soil texture, water use efficiency, and integration of multiple forage legumes in economically efficient dry bean cropping systems. New production strategies have resulted in the development of sugarbeet root systems that will produce optimal economic returns.

Mr. **WHITTEN**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **JORDAN**. The initial proposal indicated a five-year time period would be required to complete this project. It is now anticipated that work may be completed in fiscal year 1992.

BELGIAN ENDIVE, MASSACHUSETTS

Mr. WHITTEN. Please provide a description of the work that has been done under the belgian endive program to date and the period of the existing contract.

Dr. JORDAN. Several varieties and various cultural practices have been evaluated to determine the optimum cultural conditions needed to produce maximum yields of a quality crop. The fiscal year 1989 grant runs through April 1990. CSRS has requested the Massachusetts Agricultural Experiment Station to submit a grant proposal for fiscal year 1990 that has not yet been received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1987-1989, $60,000 per year; FY 1990, $59,000. A total of $239,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Massachusetts Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research to date has determined the varieties, soil type, nitrogen nutrition, rate and date of planting and weed control recommendations needed to produce optimum yields of high quality Belgian endive. In vitro techniques have also been developed to study growth and carbohydrate utilization by this crop.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial proposal indicated that six years would be needed to develop recommendations for production of this crop in the New England area.

BLUEBERRY SHOESTRING VIRUS, MICHIGAN

Mr. WHITTEN. Please provide a description of the work that has been done under the blueberry shoestring virus program to date and the period of the existing contract.

Dr. JORDAN. Research in fiscal year 1989 involved evaluation of the progeny of blueberry crosses for resistance to infection by the blueberry shoestring virus, BBSSV. Work continued on evaluation of wild blueberry clones from across the United States and abroad. Work continued on genetic transformation of horiticulturally-valuable, BBSSV-susceptible blueberry varieties into resistant types. Research on another serious blueberry disease, blueberry leaf mottle virus, BBLMV, involves study of means of spread of the virus. The fiscal year 1989 grant supports this research through April 1990. The fiscal year 1990 grant proposal has been received and is under agency review.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1981, $100,000; FY 1982-1985, $96,000 per year; FY 1986-1989, $92,000 per year; FY 1990, $91,000. A total of $943,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. **Jordan**. This research is being conducted by the Michigan Agricultural Experiment Station.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. In a diallele cross of six commercial blueberry varieties with varying levels of BBSSV resistance, crosses involving "Elliott" were the most susceptible, while "Earliblue" and "Bluecrop" progeny were the most resistant. Almost 500 clones of wild blueberries from 11 States and Canadian provinces were ELISA-treated for BBSSV. Virus infected plants were found at several locations in the midwestern and eastern United States, but were not found in the southeastern United States. A second economically serious virus causing disease of blueberry is blueberry leaf mottle virus, BBLMV. This virus is pollen-borne, i.e. infects the blueberry pollen and is spread by honeybees. Research done during 1989 has shown that bees will leave their hive, forage in an area, pollinating blueberry bushes and then visit other hives up to 1600 meters away, which could contaminate those distant hives and thus effectively spread the virus quickly from one field to another. Information has been given to growers regarding management strategies for hive placement to minimize honeybee-mediated spread of BBLMV.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. This university researchers originally anticipated that the work should be completed in fiscal year 1990 but have now extended this to 1992.

BROOM SNAKEWEED, NEW MEXICO

Mr. **Whitten**. Please provide a description of the work that has been done under the broom snakeweed program to date and the period of the existing contract.

Dr. **Jordan**. The research effort is coordinated by a Broom Snakeweed Research Task Force in the New Mexico State University College of Agriculture and Home Economics. Current research addresses three general areas for broom snakeweed: ecology and management studies; biological control studies; and toxicology and animal health. The fiscal year 1989 grant supports research through August 1990. The 1990 grant proposal has been requested by CSRS.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $100,000. The fiscal year 1990 appropriation is $148,000. A total of $248,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research is being conducted at New Mexico State University.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The primary management method in current use is herbicide spraying; however, this type of control is expensive, has short-term effectiveness and its impact on the environment must be considered. Other control methods such as burning, biological control and mechanical control are possibilities. Results to date include a state of the art proceedings on broom snakeweed from a symposium held in November 1989. Coordination with USDA-APHIS survey crews faciliated a map showing the distribution and density of broom snakeweed in New Mexico. Release of foreign insects for biological control of the plant was made at three locations in the State.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers anticipate that the work should be completed in three more years.

CELERY FUSARIUM, MICHIGAN

Mr. WHITTEN. Please provide a description of the work that has been done under the celery fusarium program to date and the period of the existing contract.

Dr. JORDAN. Fiscal year 1990 funds are being made available on a discretionary basis to the Michigan Agricultural Experiment Station to support this research. The fiscal year 1989 program involved celery genetics and breeding, celery tissue culture and somaclonal variation and induction of host plant enzymes as a pathogen defense mechanism in expression of disease resistance. The fiscal year 1989 grant supports research through March 1990. The fiscal year 1990 grant proposal has been received and is under agency review.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $40,000. The fiscal year 1990 appropriation is $39,000. A total of $79,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Michigan State University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Nineteen lines and cultivars of celery were screened in the field for resistance to Fusarium oxysporum f. sp. apii race 2 in naturally infested field sties at two locations. Most of the lines were highly susceptible to Fusarium yellows; only one of the lines showed even moderate resistance. Since these lines would require extensive backcrossing for acceptable horticultural characteristics, they will not be used further. Experiments have been performed to study the role of hydrolytic enzymes in celery resistance to Fusarium yellows disease. Two enzymes exhibited different response profiles. This demonstrated ability of chitosan to induce hydrolytic enzyme activity makes it possible to test the effect of pre-induction of these enzymes on the response of celery plants to *Fusarium* infection. If pre-induction leads to enhanced resistance, support will be lent to the hypothesis that increasing the expression of these enzymes via genetic engineering may increase the level of Fusarium yellows resistance in celery.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed in fiscal year 1993.

CHESAPEAKE BAY AQUACULTURE, MARYLAND

Mr. WHITTEN. Please provide a description of the work that has been done under the Chesapeake Bay Aquaculture program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal. This will be the first year in the implementation of this program. The program will focus on the culture of striped bass hybrids in the area of fish health, reproduction and genetics, and nutrition.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $370,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the University of Maryland.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. This research will address the needs of the aquaculture industry in the Chesapeake Bay area. The fiscal year 1990 proposal has been requested.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the work will be completed in fiscal year 1993.

CRANBERRY-BLUEBERRY DISEASE AND BREEDING, NEW JERSEY

Mr. WHITTEN. Please provide a description of the work that has been done under the cranberry-blueberry disease and breeding program to date and the period of the existing contract.

Dr. JORDAN. Research supported by fiscal year 1989 funds involved determining the causes of cranberry dieback and fairy ring; broadening germplasm diversity of blueberry and cranberry, and their relatives; interspecific gene transfer within the genus *Vaccinium*; developing insect and disease resistance, and improved winter-hardiness; and conducting basic studies on a serious bog weed, redroot. The fiscal year 1989 grant supports this research through March 1990. The FY 1990 grant has been received, and is under review in the Agency.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1985, $100,000; FY 1986-1987, $95,000 per year; FY 1988-1989, $260,000 per year; FY 1990, $257,000. A total of $1,067,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the New Jersey Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Nematodes and *Phytophthora* or *Pythium* fungi were suspected as causal agents of cranberry fairy ring and dieback, but could not be associated with dieback symptoms. Soil samples from the edge of diseased areas were screened for potential pathogens. A *Phialophora* fungus was isolated frequently and was selected for pathogenicity tests. In studies on genetic diversity within the *Vaccinium* genus, clonal collections amounting to 50-75 plants in each of five species have been made. *Vaccinium* hybridizations with various objectives in mind have been made. Seed has been germinated and transplanted to the field for evaluation. In research on control of the redroot weed, a chemical screening test including eighteen compounds was conducted. Four treatments resulted in excellent control of redroot. Grower interest and support for IPM programs resulted in a doubling of the number of growers and acreage receiving services in 1989. Twelve growers and nearly 200 acres were serviced by two field scouts.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that work may be completed in fiscal year 1992.

DAIRY AND BEEF PHOTOPERIOD, MICHIGAN

Mr. WHITTEN. Please provide a description of the work that has been done on the dairy and beef photoperiod program to date and the period of the existing contract.

Dr. JORDAN. Michigan State University scientists continued research on the effect of controlled photoperiods on various growth responses of cattle during FY 1989. Eight scientific papers including abstracts, were published during 1988-89. Long days and high-intensity daily light increased the concentration of prolactin in young male cattle. Prolactin response to photoperiod was independent of the testis function. Short durations of daily light favored fat accretion, whereas long-day photoperiods favored protein accretion. Feed treated with the hormone melatonin increased the percent fat and decreased percent protein in carcasses of growing heifers. Melatonin feeding associated with short days reduced mammary growth, milk yield and increased fat. The FY 1989 grant supports this research through November 1990. A grant proposal for FY 1990 has been submitted and is being reviewed.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1979, $242,500—Animal Health; FY 1980-1981, $35,000 per year; FY 1982-1983, $34,000 per year; FY 1984-1985, $35,000 per year; FY 1986-1990, $33,000 per year. A total of $615,500 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is conducted at Michigan State University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Investigations to date have demonstrated the effects of photoperiod on body composition and other characteristics of cattle. Plans for 1990 involve further study on the physiological mechanisms whereby photoperiod affects mammary development, lactation rates and composition of gain in the bovine. Hormonal interrelationships among melatonin, prolactin and growth hormone will be studied in lactating cows administered exogenous melatonin during controlled photoperiods. Additional information will be obtained on milk yield, milk constituents and body composition. These experiments will enhance our understanding of the role of melatonin in the suppression of lactation associated with short-day photoperiods, and this knowledge will aid the development of new methods to control these economically important traits.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The research program has changed direction giving more emphasis to obtaining basic information about hormonal responses to changes in photoperiods. Future research could compete for funds through the Animal Systems program in the National Research Initiative.

DAIRY GOAT RESEARCH, PRAIRIE VIEW A&M, TEXAS

Mr. WHITTEN. Please provide a description of the work that has been done under the dairy goat research program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not yet been received. Research is being planned at the institution to study the regulatory proteins of pregnancy to improve reproductive efficiency in the female dairy goat. A better understanding of the interactions occurring between the early conceptus and the maternal reproductive system is critical to reducing early embryonic loss.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants were awarded from funds appropriated as follows: fiscal years 1983 through 1985, $100,000 per year; fiscal years 1986 through 1988, $95,000 per year; fiscal year 1990, $74,000. No funds were appropriated in fiscal year 1989. A total of $659,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at Prairie View A&M University in Texas.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The overall objectives of the research being planned are to catalogue and to improve the understanding of the regulatory role of caprine conceptus proteins during the period of early maternal recognition of pregnancy. In addition, endometrial protein secretions in the uterus during early pregnancy will be studied and compared to the bovine and ovine species. The experimental results will help researchers identify key regulatory proteins which may be altered to enhance fertility.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The specific proposal for FY 1990 involves a two-year study.

DARK-END SYNDROME OF POTATOES

Mr. WHITTEN. Please provide a description of the work that has been done under the dark-end syndrome of potatoes program to date and the period of the existing contract.

Dr. JORDAN. This program, involving the Idaho, Oregon, and Washington State Agricultural Experiment Stations, has been conducted to determine the stages of plant and tuber development which are most susceptible to drought and temperature stress, which may cause the development of this condition. Various cultural practices, including fertilizer, date and rate of planting, various irrigation regimes, and selected russet potato varieties have been evaluated in order to lessen the impact of this condition on the Northwestern United States potato industry. The fiscal year 1989 grants terminate between May 1990 and June 1991. CSRS has requested the Idaho, Oregon and Washington Agricultural Experiment Stations to submit grant proposals for FY 1990 that have not yet been received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. This research was initiated in fiscal year 1987 and $150,000 has been appropriated each year in fiscal years 1987 through 1989. In fiscal year 1990, $49,000 has been appropriated. A total of $499,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Idaho, Oregon, and Washington State Agricultural Experiment Stations.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research conducted to date has shown that very high and/or very low temperatures in the early part of the season, as well as low moisture, can result in malformed tubers with sugary ends. Antitranspirants applied to foliage have little or no effect on the sugar-end conditions on susceptible cultivars. Stressed Russet Burbank was considerably less tolerant to the sugar-end condition than Lemhi grown under the same conditions, thus indicating a potential for the development of lines resistant to this physiological disorder.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial proposal for these grants indicated that five years would be needed to solve the dark-end syndrome problems of potatoes.

DELTA RURAL REVITALIZATION, MISSISSIPPI

Mr. WHITTEN. Please provide a description of the work that has been done under the Delta Rural Revitalization program to date and the period of the existing contract.

Dr. JORDAN. This project delineates a research strategy to produce a long range development plan for the Mississippi Delta region. It addresses the economic, social and political factors that enhance or impede the advancement of the Delta region. The fiscal year 1989 grant supports research through December 1990. The fiscal year 1990 grant application has been requested, but not yet received.

Mr. **WHITTEN**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **JORDAN**. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $175,000. The fiscal year 1990 appropriation is $173,000. A total of $348,000 has been appropriated.

Mr. **WHITTEN**. Where is this work being carried out?

Dr. **JORDAN**. Research is being conducted at Mississippi State University.

Mr. **WHITTEN**. What has been accomplished to date?

Dr. **JORDAN**. The results of the first phase activities are in draft form. The draft reports are being reviewed and edited for a forthcoming publication titled, "A Social and Economic Portrait of the Delta," which will serve as an analytical baseline for further work in subsequent years.

Mr. **WHITTEN**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **JORDAN**. The current grant proposal refers to a "research strategy for the production of a multifaceted, long-range development plan for the Mississippi Delta region." It is estimated that it will take a total of four years to complete this project.

DRIED BEAN RESEARCH, NORTH DAKOTA

Mr. **WHITTEN**. Please provide a description of the work that has been done under the dried bean research program to date and the period of the existing contract.

Dr. **JORDAN**. The North Dakota Agricultural Experiment Station has been involved in evaluating the yield components, nitrogen fixing efficiency, cooking quality, seed dry matter accumulation, tolerance to micronutrient deficiency, and disease conditions affecting this crop. This research has resulted in several improved cultivars with improved biological efficiency, nutritional quality and insect and disease resistance. The fiscal year 1989 grant supports this research through June 1990. CSRS has requested the North Dakota Agricultural Experiment Station to submit a grant proposal for fiscal year 1990 that has not yet been received.

Mr. **WHITTEN**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **JORDAN**. Grants have been awarded from funds appropriated as follows: FY 1977-1981, $25,000 per year; FY 1982, $24,000; FY 1983-1984, $25,000 per year; FY 1985, $50,000; FY 1986, $48,000; FY 1987-1989, $75,000 per year; FY 1990, $87,000. A total of $609,000 has been appropriated.

Mr. **WHITTEN**. Where is this work being carried out?

Dr. **JORDAN**. The research is being conducted at the North Dakota Agricultural Experiment Station.

Mr. **WHITTEN**. What has been accomplished to date?

Dr. **JORDAN**. Cooperation between the North Dakota Agricultural Experiment Station and the USDA has resulted in the joint releases of Pindak, Holberg, and Nordak pinto bean cultivars in 1981, 1983, and 1984, respectively. Several other new cultivars with early maturity, improved insect and disease resistance, desirable plant type, high yielding ability, good cooking quality and other features have been identified and incorporated into the breeding program.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial proposal for these grants indicated five years would be needed to develop new cultivars and cultural practices for the successful production of dried beans in North Dakota.

EXPANDED WHEAT PASTURE, OKLAHOMA

Mr. WHITTEN. Please provide a description of the work that has been done under the expanded wheat pasture program to date and the period of the existing contract.

Dr. JORDAN. This research is designed to develop appropriate management systems for more efficient use of the vast winter wheat acreage for livestock grazing. The objectives of this project are to evaluate the effect of wheat varieties, planting dates and cultural practices on grain yield and grazing animal performance and the effect of grazing traffic on soil compaction in conservation tillage systems. Economic models will be developed to assess farm income and ability to survive. The fiscal year 1989 grant supports research through June 1990. The grant for fiscal year 1990 has not yet been awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $400,000. The fiscal year 1990 appropriation is $148,000. A total of $548,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Oklahoma State University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Accomplishments during the first year of the study included site location characterization, installation of temporary paddocks, water lines and waterers, cattle working facilities and land preparation. Grazing studies were initiated and preliminary data collected.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial proposal projected five years for the completion of this research project.

EXPORT SERVICES, OREGON

Mr. WHITTEN. Please provide a description of the work that has been done under the export services program to date and the period of the existing contract.

Dr. JORDAN. This program includes research on foreign food product standards and labeling requirements especially those of the countries of Japan, Korea, and Taiwan; the analysis of U.S. products destined for those markets to ensure that they meet these standards; and research on more effective analytical methods. The grant proposal has been received and is being processed.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant begins in fiscal year 1990, and the appropriation for fiscal year 1990 is $247,000.

Mr. **Whitten**. Where is the work being carried out?

Dr. **Jordan**. The grant is being awarded to the Oregon Agricultural Experiment Station to support export service research that will be carried out at the Wheat Marketing Center facility in Portland.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The objective is to conduct a program of research on food product standards and labeling requirements promulgated by foreign countries, develop and/or adopt techniques to ensure U.S. food products for export are in compliance, and provide technical expertise and information about these services to the food industry in the U.S. and especially those located in the Pacific Northwest.

Research planning for the program has been completed and the resource needs identified. The laboratory needs to be equipped, staffed, and operations implemented. The State of Oregon will provide substantial cost sharing.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The principals anticipate that the work will be completed in fiscal year 1991.

FLORICULTURE, HAWAII

Mr. **Whitten**. Please provide a description of the work that has been done under the floriculture program to date and the period of the existing contract.

Dr. **Jordan**. Production of cut flowers and foliage for overseas markets has grown rapidly during the past few years. With the increase in production and sales, there have been a number of new preharvest and postharvest and pest problems. Thus, a new interdisciplinary research program will be started to find new methods of producing disease and insect free cut flowers and foliage that have the high quality demanded by the new markets. The fiscal year 1989 grant supports research through September 1990. CSRS has requested the university to submit a grant proposal for fiscal year 1990 that has not yet been received.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $300,000. The fiscal year 1990 appropriation is $296,000. A total of $596,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research is being conducted at the University of Hawaii.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. Research is being conducted to obtain control measures for the disease and insect pests that are damaging the production and quality of Hawaii grown cut flowers and foliage. Research to date shows that a postharvest treatment of cyanide can control existing insect pests of flowers being shipped to market and that several new insecticides are more effective than soaps and oils in controlling insects of flowering plants. Several new fungicides show promise of controlling plant diseases during the growing season and tissue culture is being used to grow disease free plants for plant nutritional studies. Also, there are indications that anthurium blight can be reduced if anthuriums are fertilized with nitrate nitrogen instead of the ammonia form.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that work may be completed in fiscal year 1993.

FOOD AND AGRICULTURE POLICY INSTITUTE, IOWA AND MISSOURI

Mr. WHITTEN. Please provide a description of the work that has been done at the food and agriculture policy institute at Iowa State University and the University of Missouri to date and the period of the existing contract.

Dr. JORDAN. The Food and Agriculture Policy Research Institute—FAPRI—was established by Iowa State University and the University of Missouri, Columbia, in 1984. The purpose of the institute is to conduct analyses and disseminate information on the sectorial impacts of U.S. food, agricultural, and trade policies. Results are disseminated to producer and agribusiness groups, Administration officials, and the Congress. FAPRI receives financial support from the host universities in addition to the special research grant administered by the Cooperative State Research Service.

The research grants awarded in fiscal year 1989 extend through June 1990 at the University of Missouri and September 1990 at Iowa State University. The fiscal year 1990 FAPRI grant proposal has been received from Iowa State University and has been requested by CSRS from the University of Missouri.

Mr. WHITTEN. How long has the work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1984-1985, $450,000 per year; FY 1986-1987, $357,000 per year; FY 1988, $425,000; FY 1989, $463,000; and FY 1990, $714,000. A total of $3,216,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The program is carried out at the Center for Agriculture and Rural Development, Iowa State University and Center for National Food and Agricultural Policy, University of Missouri.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Models and data sets have been developed to conduct sector analyses of the impacts and effectiveness of farm programs. During the past year, FAPRI conducted analyses for policy makers on "The Triple Base" Program, appropriate stocks of basic commodities for food security, and the effects of extending the Food Security Act of 1985 through 1995. Other analyses addressed the effects of freezing target prices and maintaining 40 million acres in the CRP program. FAPRI completed other routine analyses including an update of its base line analyses under various scenarios.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The characteristics of this research and demands for results from this research preclude establishing precise termination date.

FOOD MARKETING POLICY CENTER, CONNECTICUT

Mr. WHITTEN. Please provide a description of the work that has been done under the Food Marketing Policy Center program to date and the period of the existing contract.

Dr. JORDAN. The Food Marketing Policy Center was established in 1988 at the University of Connecticut at Storrs. The Center conducts interdisciplinary research on food and agricultural marketing and related public policy issues. The research program objective is to improve market performance for the benefit of farmers and consumers.

The fiscal year 1989 grant supports the research program through October 1991. The University has been requested to submit a proposal for the fiscal year 1990 grant.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work to be supported by this grant began in fiscal year 1988. The appropriation for fiscal year 1988 was $150,000, $285,000 for fiscal year 1989, and $373,000 for fiscal year 1990. A total of $808,000 has been appropriated.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. The research is being carried out by the Connecticut Agricultural Experiment Station at Storrs.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The Center's research program is to identify marketing problems and assess alternatives that would improve the performance of the U.S. agricultural and food marketing sector and complement the research program of Hatch regional research project NE-165, "Private Strategies, Public Policies and Food System Performance."

The Center has completed a comprehensive research plan and proceeded with implementation. Research is being targeted at three problem areas: factors shaping decisions by food firms and consequent effects, assess impacts on firm food safety and quality strategies from public intervention, and analyze public policies affecting competition in food markets. The Center is currently acquiring research staff and data sets. Studies are underway on vertical coordination effects on food industry performance, competitiveness strategies of farm cooperatives and investor owned food firms, and product liability strategies of food firms. In addition, the Center is organizing a food safety conference as part of its outreach and information dissemination effort and providing support to the NE-165 research program.

Mr. WHITTEN. When do the principal reseachers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The characteristics of this research and demands for results from this research preclude establishing a precise termination date.

FOOD SYSTEMS RESEARCH GROUP, WISCONSIN

Mr. WHITTEN. Please provide a description of the work that has been done under the Food Systems Research Group to date and the period of the existing contract.

Dr. JORDAN. The Group conducts research on issues affecting the organization and performance of the U.S. food system. Research objectives are to analyze factors affecting the competitiveness of U.S. food industries and markets including new technologies, market structure, and government policies. The fiscal year 1989 grant supports this research through August 1992. A fiscal year 1990 grant proposal has been requested.

Mr. WHITTEN. How long has this work been underway, and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awaded from funds appropriated as follows: FY 1976–1981, $150,000 per year; FY 1982–1985, $156,000 per year; FY 1986–1989, $148,000 per year; FY 1990, $[illegible]19,000. A total of $2,335,000 has been appropriated.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. The grant supports a core research group at the Wisconsin Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The Food Systems Research Group has completed numerous studies on the economic structure and performance issues confronting the U.S. food manufacturing and distribution system. During its existence, the Group has published 20 books and monographs, 45 journal articles, 90 working papers, and presented testimony on numerous occasions to several Congressional committees. The Group conducts basic research on market theories; effects of mergers, new technologies, and firm conduct on industry structure; factors affecting industry prices, profits, efficiency and progressiveness; and impact on public policies on food system organization and performance. Current research in progress includes an assessment of the restructuring of the beef, hog, and broiler packing industries on farmers and consumers, causes of structural change in producer goods and low advertised consumer goods product classes in food manufacturing, and in collaboration with two Hatch/Regional Research Projects, NE-165 and NC-194, a complete revision of a comprehensive book released in 1985 on the food industries that will be based on 1987 census data.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The characteristics of this research and demands for results from this research preclude establishing a precise termination date.

GRASSHOPPER BIOCONTROL, NORTH DAKOTA

Mr. WHITTEN. Please provide a description of the work that has been done under the grasshopper biocontrol program to date and the period of the existing contract.

Dr. JORDAN. The fungal pathogen, Entomophaga grylli, is being developed as a biological control agent for grasshoppers. The host range and the naturally occurring disease levels for the fungus parasite of the grasshopper was determined. Over 50,000 grasshoppers of 56 species were examined and 16 species were found to be naturally susceptible to infection. Both native strains of the fungus were present throughout North Dakota. Progress has been made in developing an effective formulation for field use by encapsulating spores in calcium alginate. This formulation preserves the viability of the fungal spore in storage. The fiscal year 1989 grant has been awarded and supports research through July 1990. The fiscal year 1990 grant proposal is in preparation.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for the fiscal year 1989 was $69,000. The fiscal year 1990 appropriation is $71,000. A total of $140,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at North Dakota State University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The scientist will focus research on further development of an effective formulation which will serve as a carrier of the spores in a commercial spray system and protect the viability of the infective spores once they have been applied. In order to develop a suitable formulation, the effect of UV light and sunlight on the spores of the grasshopper fungus will be determined. Research will be done to develop methods for mass production of the fungal spores. These developments will set the stage for field testing and évaluation of the grasshopper fungus, Entomophaga grylli, for control of range grasshoppers.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated the work may be completed in fiscal year 1993.

HUMAN NUTRITION, NEW YORK

Mr. WHITTEN. Please provide a description of the work that has been done under the human nutrition program to date and the period of the existing contract.

Dr. JORDAN. The research objective is to estimate total energy expenditure in humans living in their normal environment. The researchers plan to assess metabolic adjustment that humans make in response to physiological and environmental stresses, pregnancy, lactation, adolescent growth, inadequate food intake, infections and work. The fiscal year 1989 grant supports research through August 1990.

Mr. WHITTEN. How long has this work been underway, and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989, and the appropriation for fiscal year 1989 was $450,000. The fiscal year 1990 appropriation is $556,000. A total of $1,006,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Cornell University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. A mass spectrometer was purchased and qualified professional staff were hired. The next stage is validation prior to conducting the human studies.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It was anticipated that work may be completed in fiscal year 1993.

INTEGRATED ORCHARD MANAGEMENT, VERMONT

Mr. WHITTEN. Please provide a description of the work that has been done under the integrated orchard management program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not yet been received.

Research will be conducted on the feasibility of reducing pesticide and fertilizer use in commercial orchards by developing new integrated pest and growing techniques. Scientists representing entomology, plant pathology and horticulture will be working together.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $49,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the University of Vermont.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research will be conducted on finding integrated pest and production methods that can reduce pesticide use while still producing profitable crops of high quality applies.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that work may be completed in fiscal year 1994. The President's budget includes a proposal to increase the integrated pest management special grant by $1 million. Any future Integrated Pest Management research proposals could be submitted for funding consideration under the integrated pest management program.

INTEGRATED PEST MANAGEMENT

Mr. WHITTEN. Please provide a description of the work that has been done under the Integrated Pest Management program to date and the period of the existing contract.

Dr. JORDAN. In 1984, a National Integrated Pest Management Program was developed based on regional programs and funded by Special Research Grants that were awarded on a competitive basis on research priorities identified by the Association of Directors in the four State Agricultural Experiment Station regions.

In April 1989, a National IPM Symposium/Workshop was held. The large attendance of 500 persons documents widespread scientific interest in the role of IPM in addressing current and future agricultural productivity and environmental issues. Major advances discussed at the workshop include: gene transfer technologies which will enable more rapid development of pest-resistant crops and more effective biological control agents, new understanding of population genetics, more specific pesticides effective at very low rates, advances in learning how to manage resistance to pesticide and resistant mechanisms in crops, improved technologies for studying pest movement and dispersal, pheromones for insect monitoring and control, and desk-top computer availability with associated models, knowledge based systems and communication capabilities. Also scientists from pest control disciplines are cooperating among themselves and with engineers, modelers, agronomists, horticulturists and economists in efforts to improve IPM systems. The capability to constructively impact on agricultural productivity and environmental issues has never been greater. Fiscal year 1989 grants will terminate between January 1990 and June 1992. Fiscal year 1990 grants are in the process of being awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated to CSRS as follows: FY 1981, $1,500,000; FY 1982-1985, $3,091,000 per year; FY 1986-1989, $2,940,000; FY 1990, $2,903,000. The Consortium for Integrated Pest Management received funding from EPA and USDA over the period FY 1979 through FY 1985. The National Program for Integrated Pest Management received funds from FY 1984 through FY 1990. A total of $28,527,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Between 1984 and 1989 the research has been conducted at 46 State Agricultural Experiment Stations through approximately 293 grants awarded to interdisciplinary scientists on the basis of relevancy to IPM regional priorities and proposal qualify as evaluated by scientific peer review.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The approach to IPM is evolving to emphasize the total ecology of crop production and the entire ecosystem to bring multi-benefits to agriculture, consumers—food safety, and the resource base—ground and surface water, soil conservation. This is being accomplished through a wider application of population and community ecology, an ability to effectively deal with pest complexes and understanding multiple stress factors and their total impact upon crop production systems, and transferring information to the grower through the concept of "knowledge-based systems" to produce answers that are not encumbered with a high degree of risk. The challenges and need for these systems will be even greater in the future as we integrate the products of biotechnology into these systems.

For example, when the complex ecological systems are understood and predicted through a limited number of key processes, improved management can be achieved by altering key processes. Control of the pasture weed ragwort by the introduced natural enemies, cinnabar moth and ragwort flea beetle, have provided the model for understanding key processes of introduction of insect natural enemies and density of ragwort flowering plants, decline in ragwort and increases of perennial grasses, impact of disturbances such as surface tilling and control re-establishment, the plateau relationship between number of beetles and host biomass, searching efficiency of flea beetles and likelihood of host refugia.

For example, when the interrelation of pest populations are understood computer enhanced delivery systems can be developed to produce answers that are not encumbered with a high degree of risk. Population densities of the soybean cyst nematode have been found to influence soybean growth which impacts weed and corn earworm population dynamics. The presence of weeds in soybeans affects corn earworm larval populations, and defoliation of soybean by corn earworm larvae influenced weed growth and late season soybean cyst nematode populations densities. The evaluation of multiple pest effects on yield loss revealed that acceptable densities of soybean cyst nematode in the absence of other pest species may become unacceptable if corn earworm and/or weed populations are also present.

In addition, interactions of pesticides, pesticide resistance management, and the future management of transgenic genes that protect plants from pests is a primary concern of IPM. Pest resistance to pesticides has been so severe in the past that cotton could not be produced in some areas of the Southwest. The best approach to the resistance problem for insects, diseases, rodents and weeds, is through the reduced and proper use of pesticides.

IPM scientists are cataloging knowledge about IPM in forms that are accessible to reasoning systems and recognizing the existence of knowledge that is not expressible in mathematical equations. IPM is now benefiting from more powerful knowledge-based systems that achieve much greater depth and flexibility.

In summary, continuing research is required to maintain and adapt existing IPM programs to changes as they occur in our agricultural production systems. IPM is a key component of sustainable agriculture.

Mr. Whitten. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. Jordan. Selected categories of the Special Research Grants program address important national/regional research initiatives. The IPM program involves research on biological systems that by their nature are ever changing and presenting new challenges to agriculture. Especially with the new sensitivities about safety and the enviornment, there is a high priority for continuation of these ongoing projects.

INTEGRATED PRODUCTION SYSTEMS, OKLAHOMA

Mr. Whitten. Please provide a description of the work that has been done under the integrated production systems program to date and the period of the existing contract.

Dr. Jordan. Research has been conducted on various mulches, evaporative cooling devices, and plant regulators to determine their effect on ground temperatures, and which vegetables and small fruits can best survive under stress conditions in southeastern Oklahoma. New cultural practices have been developed, including various rates and dates of planting, adapted varieties, and disease and insect strategies. The fiscal year 1989 grant supports this research through June 1991. CSRS has requested that Oklahoma

Agricultural Experiment Station to submit a grant proposal for fiscal year 1990 that has not yet been received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1984, $200,000; FY 1985, $250,000; FY 1986, $238,000; FY 1987-1989, $188,000 per year; FY 1990, $186,000. A total of $1,438,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research is being conducted at the Oklahoma State Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. This research has helped to improve the economic outlook for small scale farmers in southeastern Oklahoma, by demonstrating that selected crops, including Christmas trees, peaches, and other tree crops can be successfully intercropped with vegetables and/or small fruits. Economic analyses have shown that farmers receive a greater monetary return for inputs expended by use of intercropping practices with crops that are compatible with each other.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial funding for this grant indicated five-years would be necessary to answer the problems concerned with production of fruits and vegetables in southeastern Oklahoma.

INTERNATIONAL LIVESTOCK PROGRAM, KANSAS

Mr. WHITTEN. Please provide a description of the work that has been done under the international livestock program in Kansas to date and the period of the existing contract.

Dr. JORDAN. There were numerous accomplishments for the International Meat and Livestock Program—IMLP—during FY 1989. A beef breeding exhibit for an exposition in Chihuahua, Mexico was developed and a trade mission resulted. Fifteen head of purebred bulls were displayed and sold to Mexican breeders. Also, as a result of this mission, Mexican beef producers have traveled into Kansas, Oklahoma and Texas and purchased breeding stock.

The Mex-Thai beef tour through Missouri, Kansas, Oklahoma, Texas and New Mexico resulted in the sale of 40 head of Brahman cattle from Texas to Thailand.

Twenty-one students from Paraguay attended a nine-week training session in animal agriculture at Kansas State University. Semen, embryos, and farm equipment sales to Paraguay have been completed as a direct result of their visit to Kansas.

Artificial insemination and embryo transfer schools have been conducted for two groups from Mexico. Staff members from Kansas State University and the private sector have been employed to provide within country expertise as a result.

Meats training for participants from Poland has resulted in requests for information on equipment and more expertise and formal training.

An evaluation of the Korean beef cattle industry stressed the need for additional training in forage production, carcass processing and the establishment of meat standards for Korea.

The fiscal year 1989 grant supports this research through September 1990. A research proposal for FY 1990 funds is being prepared.

Mr. **Whitten.** How long has this work been underway and how much has been appropriated through Fiscal Year 1990?

Dr. **Jordan.** Grants have been awarded from appropriated funds in the amount of $95,000 per year for fiscal years 1986–1989; $94,000 for fiscal year 1990. A total of $474,000 has been appropriated.

Mr. **Whitten.** Where is this work being carried out?

Dr. **Jordan.** This program is in progress at Kansas State University.

Mr. **Whitten.** What has been accomplished to date?

Dr. **Jordan.** As a result of this program students from many foreign countries have had exposure to modern agricultural technology. In FY 1989 a training school was conducted for Medical beef managers and an artificial insemination/embryo transfer course was offered for Mexican students. Plans are being made to ship live cattle from Kansas to Mexico for exhibition and sale at agricultural shows. A Chinese veterinarian will be sponsored for six to nine months to learn U.S. procedures for exporting livestock.

Mr. **Whitten.** When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan.** It is anticipated that two years may be required to complete this work.

IOWA BIOTECHNOLOGY CONSORTIUM

Mr. **Whitten.** Please provide a description of the work that has been done under the Iowa Biotechnology Consortium program to date and the period of the existing contract.

Dr. **Jordan.** The University of Iowa, together with the City of Cedar Rapids and Iowa State University, are conducting a joint research and demonstration project to develop and test methods to turn fermentation by-products into useful new products. The intention is to reduce the burden of waste products from bioprocessing plants upon municipal waste management systems, while at the same time increasing opportunities to develop commercially viable products. In so doing, the project will provide a model for other municipalities to form productive government-industry-university consortia to explore methods to turn waste into assets. The fiscal year 1989 grant supports research through December 1993.

Mr. **Whitten.** How long has this work been under way and how much has been appropriated through fiscal year 1990?

Dr. **Jordan.** The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $1,225,000. The fiscal year 1990 appropriation is $1,593,000. A proposal for renewal of the project is now being prepared for evaluation. A total of $2,818,000 has been appropriated.

Mr. **Whitten.** Where is this work being carried out?

Dr. JORDAN. Research is being conducted at the University of Iowa and Iowa State University, in collaboration with the City of Cedar Rapids.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. As a new program in fiscal year 1989 the consortium focused on two main activities. The first was the sponsorship of an international symposium to establish a communication network of researchers in this area of interest. The second activity focused attention on the analysis of fermentation waste streams and the application of these wastes to land.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The complexity of the science indicates that the pilot work should extend over at least a five-year period.

LIVESTOCK AND DAIRY POLICY, NEW YORK AND TEXAS

Mr. WHITTEN. Please provide a description of the work that has been done under the livestock and dairy policy program to date and the period of the existing contract.

Dr. JORDAN. The purpose of this grant is to assess the possible impacts of various macroeconomic and farm policies, new technologies, and trade agreements on the U.S. livestock, poultry and dairy sectors. The Texas A&M grant covering livestock and poultry supports research through December 1989. The university has submitted a proposal to renew this grant with funds appropriated in fiscal year 1990. The Cornell University grant supports research on dairy policy through October 1990. The universities are in the process of preparing grant proposals for funds appropriated in fiscal year 1990.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989. The appropriation for fiscal year 1989 was $450,000, and the fiscal year 1990 appropriation is $518,000. A total of $968,000 has been appropriated.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. The research is being conducted at Cornell University and Texas A&M University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The research program is to analyze the impacts of fiscal and monetary policies, current and proposed farm policies, trade agreements, and new technologies on the dairy, livestock, and poultry sectors. Cornell is developing and modifying several dairy market models to assess the effectiveness of current dairy programs and to evaluate dairy policy alternatives for the Farm Bill. Farm bill policy options are being generated from operation of these dairy sector and spatial models and are being reported to farmers, industry representatives, and public policy makers via workshops and a very extensive cooperative extension education effort invovling 23 States. Cornell is also collaborating with Texas A&M in the development of representative farm models to assess policy impacts at the farm level. Cornell needs to complete development of key data sets and models to analyze the macroeconomic and trade policy options and implications of new dairy production and processing technologies.

Texas A&M is developing and applying analytical techniques to assess farm and macroeconomic policy impacts on the cattle industry and producers. Other studies are focusing on impacts on feed grain output and the spillover effects on the livestock industry. Several studies are underway to estimate the impacts of adoption of bST, bovine somatotropin, on the dairy industry under various dairy policy scenarios. Research information is disseminated to industry and producer groups and public policy officials via workshops and publications. Remaining work includes developing the analytical tools to assess proposed trade, conservation, fiscal and monetary policies, and new technologies, and to develop and maintain the appropriate data bases to conduct these analyses.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The Livestock and Dairy Policy research efforts now underway at Cornell and Texas A&M are very similar to the Food and Agricultural Policy Institute and other policy oriented research programs. The characteristics of this research and demands for results from this research preclude establishing a precise termination date.

LOWBUSH BLUEBERRY RESEARCH, MAINE

Mr. **Whitten**. Please provide a description of the work that has been done under the lowbush blueberry research program to date and the period of the existing contract.

Dr. **Jordan**. CSRS has requested the university to submit a grant proposal that has not yet been received.

In the United States, lowbush blueberries are grown commercially in Maine only. This crop has special growing, harvesting and processing needs which are different from other blueberry species such as cultivated highbush and rabbiteye blueberries grown elsewhere. Research will be conducted on improving pest control, irrigation, growing methods, flower pollination, the canned product, and postharvest quality.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $170,000.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research will be conducted at the University of Maine.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The preharvest and postharvest research to be conducted on lowbush blueberries will enable the industry to remain competitive and expand.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The university researchers anticipate that the work may be completed in fiscal year 1994.

LOW-INPUT AGRICULTURE, MINNESOTA

Mr. **WHITTEN**. Please provide a description of the work that has been done under the low-input agriculture project and the period of the existing contract.

Dr. **JORDAN**. Research on the low-input "Farming by Soil" management concept was conducted in 1989 on a field location in southwestern Minnesota. The "Farming by Soil" concept has the purpose of improving technologies of application of fertilizers and herbicides to specific soil and landscape positions, thus preventing over- or under-application of these materials. The overall goals of the "Farming by Soil" concept is to enhance soil productivity; reduce soil erosion and run-off and surface and groundwater pollution, thus, increasing farm profitability. The fiscal year 1989 grant supports this research through June 1991. The fiscal year 1990 grant has not yet been awarded, but the research proposal for fiscal year 1990 is already being prepared.

Mr. **WHITTEN**. How long has this work been underway and how much as been appropriated through fiscal year 1990?

Dr. **JORDAN**. The work supported by this grant began in fiscal year 1988. The appropriation for fiscal years 1988 and 1989 was $100,000 per year. The fiscal year 1990 appropriation is $148,000. A total of $348,000 has been appropriated.

Mr. **WHITTEN**. Where is this work being carried out?

Dr. **JORDAN**. The research is being conducted by the Department of Soil Science at the Minnesota Agricultural Experiment Station, University of Minnesota. The work is being done both in the soil science laboratories and at field sites on various Experiment Station research branches and on private farms in Minnesota.

Mr. **WHITTEN**. What has been accomplished to date?

Dr. **JORDAN**. Treatments compared conventional and Farming by Soil practices. Preliminary results are showing *a benefit of $20* when using the Farming by Soil management system. This was obtained without using more chemicals, but using a better distribution of fertilizers and herbicides. Six plots, on a hillslope, located at the Experiment Station were selected to study the movement of pesticides under conventional versus soil-specific management. The 1989 rainfall was substantially lower than the average rainfall and the soil moisture content was very low. However, a good distribution of the rain throughout the growing season saved the crop. Because of these conditions, no leaching of pesticide was measured for any treatment. A continuous yield measurement experiment, executed on selected strips of the same field, showed such a practice gives a better estimate of yield goals, and better fertilizer recommendations. An experiment using models to screen soils for their leaching potential of nitrates is in progress. Testing of this model shows it to be more accurate on soils of coarser textures than clay loam. More testing of this model is in progress. Another experiment was established using undisturbed soil columns for screening soil in regard to their pesticide leaching potential. The three soil types found on the small plots in the research field area were used but more soils need to be tested. There is a need to extend the project to evaluate soil-specific management under different soil types before presenting a final conclusion on the benefits of soil-specific management.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated the work may be completed in fiscal year 1992.

MAPLE RESEARCH, VERMONT

Mr. WHITTEN. Please provide a description of the work that has been done under the maple research program to date and the period of the existing contract.

Dr. JORDAN. Research on the interaction of acid rain with maple leaves has led to the understanding that nutrient leaching through leaves contributes little to the chemistry change of precipitation as it falls through the forest canopy. This grant terminated June 30, 1989. Research on the water stress physiology of maple trees had to be repeated due to the fire at the laboratory on February 19, 1988. Original models were improved during the summer of 1989 to explain resistance to water flow from soil to leaves and improved techniques were developed for measuring water storage in maple stems. Several publications have resulted from this research. Research of fertilizer applications to both healthy and declining sugar maples was begun with acquisition of pretreatment baseline information. Fertilizer and lime applications will be made soon. The fiscal year 1989 grant supports research through June 1990. A fiscal year 1990 grant proposal has been requested, but has not yet been received from the University.

Mr. WHITTEN. How long has this work been under way and how much has been appropriated through the fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1985, $100,000; fiscal years 1986 and 1987, $95,000 per year; fiscal years 1988 and 1989, $100,000 per year; fiscal year 1990, $99,000. A total of $589,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Vermont Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Measurements made the summer of 1989 focused on the smallest branches of maple trees, which bear most of the leaves. Results show that up to 50 percent of the total resistance of water flow from soil to leaves occurs in these branches. This information is being used to re-evaluate models of the development of water stress in the crowns of maple trees. The research on fertilization and liming of sugar maples is at the end of the first year. Work is proceeding on plans to: observe seasonal changes in starch reserves; gather baseline data on plots in healthy and in declining maple forests; and design fertilizer and lime application treatments.

Mr. WHITTEN. When do the principal researches carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The researchers have not established a specific termination date.

MICHIGAN BIOTECHNOLOGY INSTITUTE

Mr. **Whitten**. Please provide a description of the work that has been done under the Michigan Biotechnology Institute program to date and the period of the existing contract.

Dr. **Jordan**. Michigan State University is developing and demonstrating cost effective technology for bioprocessing of agricultural raw materials to value added products, including industrial chemicals, food and feed. The Institute also anticipates developing bioprocess technology to manufacture products that will lead to new market outlets for agricultural raw materials, thereby increasing their utilization and reducing surpluses. The fiscal year 1989 grant supports research through March 1990. A proposal to continue these efforts beyond March 1990 has been submitted to USDA and is undergoing peer review.

Mr. **Whitten**. How long has this work been under way and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $1,750,000. The fiscal year 1990 appropriation is $2,160,000. A total of $3,910,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. The research is being conducted on the campus of Michigan State University at the Michigan Biotechnology Institute.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. During the first year of the Institute's program their research focused on novel fermentation hydrolysis, and enzymatic transformation and separation technology that can be applied to add value to raw agricultural materials. This research is intended to lead to commerical applications through the Institute's technology transfer mechanisms.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The Institute has established specific milestones that are to be used to judge the progress of their research efforts and to plan future activities. For instance, two of the milestones measure the development of bioprocessing technology as specific increases in the production of bioprocessing products from targeted agricultural materials and development of technology that will allow the construction of a bioprocessing production plant within five years. Thus, the progress of research will determine the duration of expected activities.

MIDWEST PLANT BIOTECHNOLOGY CONSORTIUM

Mr. **Whitten**. Please provide a description of the work that has been done under the Midwest Plant Biotechnology Consortium program to date and the period of the existing contract.

Dr. **Jordan**. The purpose of the Consortium is to commercialize what currently is known in the plant sciences together with new knowledge. The transfer of technology from the member universities to the agricultural businesses of the North Central states is built into the composition of the Consortium, including the research and development process. The fiscal year 1989 grant supports research through March 1990. The Consortium is currently developing a proposal for fiscal year 1990 to continue their activities.

Mr. WHITTEN. How long has this work been under way and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $1,750,000. The fiscal year 1990 appropriation is $2,592,000. A total of $4,342,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted by members of the consortium which is comprised of ten Land-Grant institutions and six associated universities located throughout the North Central states.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The consortium intends to pursue through industrial and academic partnerships five areas of biotechnological research; plant chemistry, biochemistry, and molecular biology; processing of plant commodities into new food and non-food products; biotic stresses; abiotic stresses; and techniques to improve production of seed and genetic stocks. The projects are awarded competitively on scientific criteria and funded for defined periods of activity. The degree of success will be judged by input and feedback from the partners to determine the duration of specific efforts.

Mr. WHITTEN. When do the principal researches carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The research program of this Consortium is intended to be a five year effort, as indicated in their project proposal.

MILK CONSUMPTION, PENNSYLVANIA

Mr. WHITTEN. Please provide a description of the work that has been done under the milk consumption program to date and the period of the existing contract.

Dr. JORDAN. The current project on milk consumption is conducted under several subprojects. Three research topics are expansions of previous work covering spoilage by bacteria, quantifying use of milk products and factors that effect milk consumption. Projects that were added cover infant feeding practices and factors that affect virulence of the pathogen of recent concern in food safety, *Listeria monocytogenes*. The fiscal year 1989 grant supports reaearch through June 1991. The fiscal year 1990 grant has not yet been awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1986 through 1989, $285,000 per year; fiscal year 1990, $281,000. A total of $1,421,000 has been appropriated.

Mr. WHITTEN. Where is this work being carred out?

Dr. JORDAN. This research is being conducted at Pennsylvania State University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. One group found that certain bacteria produce high levels of lipase and might explain induction of off-flavors. The conditions for studying the bacterium, *Listeria* in the test tube were developed. Now they can model factors that affect virulence and heat resistence during pasteurization. Another group found that knowledge of actual fat content of milk is low. Consumers' concerns about health effect the type of milk they consumed, and consumer awareness and possible attitudes toward milk from hormone-treated cows were assessed. Economic analyses suggest that milk produced in the United States should be competitive in some international markets. While awaiting the results of the 1987/88 Nationwide Food Consumption Survey, another group tested their multivariate models for assessing use of dairy products on an older USDA data base.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the research in progress may be completed in fiscal year 1991.

MILKWEED RESEARCH, NEBRASKA

Mr. WHITTEN. Please provide a description of the work that has been done under the milkweed research program to date and the period of the existing contract.

Dr. JORDAN. I am pleased to provide you with a brief description of the research to be conducted on milkweed in Nebraska. This effort targets the floss derived from the pod as an insulation material for such products as jackets, blankets, and sleeping bags. Most previous work conducted with milkweed focused on the latex in the plant. The floss appears to be nearly cost competitive with imported goosedown and with synthetic insulating fibers. This effort involves a private sector firm that is interested in commercializing the technology. This firm is in fact conducting product tests for the milkweed floss. Farmers are growing about 200 acres of milkweed in cooperation with the project.

The fiscal year 1989 grant supports research through June 1990.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated for fiscal year 1990?

Dr. JORDAN. The work supported by this grant began with a $68,000 grant in fiscal year 1989. The fiscal year 1990 appropriation is $79,000; the grant application was received on February 1, 1990, and is being processed. A total of $147,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted in Nebraska by the University of Nebraska with cooperation of a private firm as well as farmers growing milkweed. In addition, the project team is maintaining variety trials in Kansas that remain from a project evaluating production of latex.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. During 1989, a self-propelled earcorn picker was modified to harvest the pods, a major step in commercialization of milkweed. While additional improvements were identified, the machine performed satisfactorily. A serious outbreak of disease occurred several weeks prior to harvest which significantly lowered yields in several fields. Researchers identified the disease as a black spot bacteria and work is underway to develop effective controls. Work was also undertaken to validate the superior, natural quality characteristics of the floss as an insulating and absorbing material.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed.

Dr. JORDAN. Commercialization requires time. The anticipated timeframe to effectively commercialize this technology is at least 3-4 years.

MINOR CROP PEST CONTROL, HAWAII

Mr. WHITTEN. Please provide a description of the work that has been done under the minor crop pest program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not been received. Pest control on Hawaii's many minor crops depends on one of the best integrated pest management, IPM, programs in the United States. Research will concentrate on critically needed pest control strategies that have resulted from pesticide cancellations. This will include a range of practices from pesticides which are IPM-compatible to non-pesticidal strategies such as hot water treatment, biorationals, and resistant varieties.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $281,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the University of Hawaii.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. This is a new project and will initially be concentrated on papaya. The objectives are to develop residue information for the ethylene bisdithiocarbamate fungicides, EBDC, on papaya in order to establish dietary risk data, and screen and develop registration data for alternative fungicides, insecticides, and herbicides for papaya and other selected minor crops for Hawaii.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate the work may be completed in fiscal year 1995. Additional research proposals could be submitted for funding consideration under the pesticide clearance special grant.

MINOR USE ANIMAL DRUGS

Mr. WHITTEN. Please provide a description of the work that has been done under the minor use animal drugs program to date and the period of the existing contract.

Dr. JORDAN. In 1982, Interregional Research Project Number 4—IR-4—was revised to include efforts to obtain FDA clearance of animal drugs intended for use in minor species and for minor use in major species. In Fiscal Years 1982-89 Special Research Grant funds were divided equally between the four IR-4 regional leader laboratories located in New York, Michigan, Florida and California and the IR-4 Headquarters at Rutgers University for support of the drug clearance program. These funds are being utilized by the leader laboratories and by allocation to State Agricultural Experiment Stations—SAES— to develop data required for meeting clearance requirements. The research arm of the IR-4 programs consists of the leader laboratories, SAES, ARS, schools of veterinary medicine and the drug industry. The fiscal year 1990 grants will terminate between March 1990 and December 1990. The fiscal year 1990 grants are currently being prepared.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1982-85, $240,000 per year; FY 1986-1989, $229,000 per year; FY 1990, $226,000. A total of $2,102,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The grants have been awarded to the four IR-4 regional leader laboratories and to IR-4 Headquarters, Rutgers University. The research is conducted by these laboratories and through allocation of these funds for specific experiments at the State Agricultural Experiment Stations, the Agricultural Research Service, the USDI Fish and Wildlife Service and in conjunction with several pharmaceutical companies.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. To date, 183 drug requests have been submitted to IR-4 for clearance. Working in conjunction with many universities, the USDI Fish and Wildlife Service, ARS and 14 different pharmaceutical companies, 27 research projects are now active and will be continued through 1990 to establish data for clearances. Thirteen public master files have been published related to the use of specific drugs in minor species with five more pending. The Center for Veterinary Medicine of the Food and Drug Administration is cooperating and supporting this program to the fullest extent. The program is a prime example of Federal interagency cooperation with the pharmaceutical industry and commodity interests to effectively meet an urgent need.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Selected categories of the Special Research Grants program address important national/regional research initiatives. The minor use animal drugs program involves research on biological systems that by their nature are ever changing and presenting new challenges to agriculture. Especially with the new sensitivities about safety and the environment, there is a high priority for continuation of these ongoing projects.

MOSQUITO RESEARCH, RICELAND AGROECOSYSTEM

Mr. WHITTEN. Please provide a description of the work that has been done under the riceland mosquito research program to date and the period of the existing contract.

Dr. JORDAN. The Riceland Mosquito Management Program—RMMP—continues to focus its efforts on basic and applied research leading to the development of control strategies that can effectively, efficiently and safely manage mosquito populations in the rice growing regions of the United States. Research activities continue to be directed toward two principal areas of interest: riceland ecosystems analyses and mosquito management methodology development. The fiscal year 1989 grant supports research through June, 1990. The fiscal year 1990 proposal is in preparation and the funds associated with this grant will cover research activities initiated or other wise extending through the period July 1, 1990 to June 30, 1991. The establishment of the Grand Prairie Municipal Mosquito Abatement Program in Arkansas as part of RMMP has enhanced the ability to perform large scale field assessments of various mosquito survey and control strategies being developed by RMMP participants. The assessments include efficacy, environmental compatibility and cost effectiveness.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal years 1982–1985, $480,000 per year; fiscal years 1986–1989, $456,000 per year; fiscal year 1990, $450,000. A total of $4,194,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research on this project is being carried out in Arkansas, California, Louisiana, Mississippi and Texas.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research accomplishments in the two principal areas of emphasis are: (1) *Ecosystems Analyses* has refined knowledge on intrinsic and extrinsic factors affecting development and survival rates of certain key species of riceland mosquitoes and age distribution and movement behaviors of these species in their adults stages. This knowledge has been and is being used to develop life tables, predictive computer models and survey techniques which assess the status and predict potential changes in the status of the population dynamics of key riceland mosquito species. This information and technology is needed by mosquito control practitioners to make accurate, timely and cost effective decisions regarding how and when to best manage riceland mosquito populations. (2) *Mosquito Management Methodology* studies have developed mosquito larvicidal strategies which made maximum use of bio-rational agents such as the bacterial toxin, BTI, insect growth regulators—IGR's—and the biological agents, *Bacillus sphaericus* and *Lagenidium giganteum*. Large-scale field trials are planned for this latter agent as soon as EPA approves the request for this fungal agent to be registered for operational use against mosquito larvae. A study is in progress to adapt an intelligent geographic information system—IGIS—to determine the potential impact of riceland mosquito control activities on threatened and endangered species. Economic studies of the Grand Prairie Municipal Mosquito Abatement Program in progess in Arkansas are providing data on the costs vs. the benefits of riceland mosquito control methodologies which are being used to demonstrate the value of such methodologies to decision makers in other areas of the U.S. Similar economic studies are being planned for the Mississippi mosquito control program once it is operational.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. It is anticipated that work may be completed in fiscal year 1991.

MULTI-CROPPING STRATEGIES FOR AQUACULTURE, HAWAII

Mr. **Whitten**. Please provide a description of the work that has been done under the multi-cropping strategies for aquaculture research in Hawaii to date and the period of the existing contract.

Dr. **Jordan**. The objective of this research is to develop design criteria for the coproduction of shrimp and oysters in aquacultural systems. Oysters are used to filter algae and suspended particles from shrimp production ponds in order to improve water quality and produce a secondary crop. Water used in oyster depuration is used to enrich shrimp production ponds. This process conserves water and decreases the cost of production. The fiscal year 1989 research grant supports research through June 1991. The fiscal year 1990 proposal has been requested.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. This research was initiated in Fiscal Year 1987 and $152,000 per year has been appropriated in Fiscal Years 1987 through 1989. The fiscal year 1990 appropriation is $150,000. A total of $606,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. This research is carried out at the University of Hawaii in the Agricultural Engineering Department.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. During the first year of implementation, initial production trials were conducted. Preliminary results indicate that acceptable production levels can be obtained in this system. Additional research has led to the refinement of the culture system and a preliminary evaluation of the economics of such production systems.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. It is anticipated that research may be completed in fiscal year 1991.

NATIONAL BIOLOGICAL IMPACT ASSESSMENT PROGRAM

Mr. **Whitten**. Please provide a description of the work that has been done under the National Biological Impact Assessment Program to date and the period of the existing contract.

Dr. **Jordan**. The National Biological Impact Assessment Program facilitates the safe field testing of genetically modified organisms. This is done through information exchange, biological monitoring and research in biosafety.

The information exchange is a distributed communication network that features an electronic bulletin board on biosafety information linked to 15 data bases on biotechnology. The program is also developing an artificial intelligence program to assist scientists in understanding the Federal Coordinated Framework for the Regulation of Biotechnology. It contains scientific and technical information on the environmental and public health safety of genetically engineered organisms. It also assists scientists in the design of safe experiments and the drafting of applications for Federal permits.

The Program's activities in biological monitoring encourage new technologies for making sure that organisms, once placed in the environment, remain and perform as expected. Methods such as genetic tagging, fingerprinting and similar procedures are in the domain of this activity.

Biosafety research is a third program element which is intended to provide new knowledge to allow safe experimentation with biotechnology altered organisms.

A fiscal year 1989 grant was awarded to Virginia Polytechnic Institute and State University to coordinate program activities.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 with an appropriation of $125,000. The fiscal year 1990 appropriation is $123,000. A total of $248,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. The research coordination is being provided by The Virginia Polytechnic Institute and State University. Partners in the program include The Pennsylvania State University, Louisiana State University, North Carolina State University, University of Arizona, Clemson University and the National Agricultural Library.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The electronic bulletin board and thirteen of the data bases have been completed and have been on-line since September 1989. Two data bases remain to be completed in the next few months. A prototype of the artificial intelligence software has been completed. By Spring 1990 nine organism groups will be incorporated. Fourteen additional organism groups are scheduled for calendar year 1990. The final program will service 79 organism groups.

Biological monitoring research and biosafety research have been undertaken this past year with particular focus on the release of microorganisms. The results of those studies are being summarized at this time.

Mr. **Whitten**. When do the principal researches carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The initial program was proposed for a 5 year period anticipating that many of the biosafety questions for field testing would be resolved at that time. Very significant progress in the development of the information system has been realized in the past year. With the enormously important scientific and public interest in the safety of human health and protection of the environmental this program is high priority.

NEW USES FOR AGRICULTURAL PRODUCTS, OHIO

Mr. **Whitten**. Please provide a description of the work that has been done under the new uses for agricultural products program to date and the period of the existing contract.

Dr. **Jordan**. This grant is part of a program in the College of Agriculture entitled, Farm Income Enhancement. Effort to date has centered on generation of a large number of product uses or ideas by inviting development of "concept papers" which set forth novel, present and future uses for Midwestern agricultural products. Nineteen concepts were presented at an Exploratory Conference in April of 1989, which attracted 120 participants from agribusiness, academia, farm organizations, and government. The concepts dealt with increasing cost competitiveness and improving product quality, developing new markets for agricultural products, developing new uses for agricultural products, and increasing the share of consumer expenditures captured by farm products. Sample projects include expanding the use of corn in the degradable plastics market and as a source of ethanol as an alternative fuel additive in the U.S. octane market. The fiscal year 1989 grant supports research through June 1990. A proposal for the fiscal year 1990 funds has recently been received from Ohio requesting funding through May 1991.

Mr. **Whitten**. How long has this work been underway, and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1988, and the appropriation for fiscal years 1988 and 1989 was $133,000 per year. The fiscal year 1990 appropriation is $131,000. A total of $397,000 has been appropriated.

Mr. **Whitten**. Where is the work being carried out?

Dr. **Jordan**. Research is being conducted at the Ohio Agricultural Experiment Station.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. In addition to the Conference held in April of 1989, the project co-sponsored an International Trade Conference in October of 1989, which emphasized high-value exports to Pacific Rim countries. New concepts will be screened and teams of research scientists, farmers, and agribusiness managers will be assembled to explore and analyze ways by which selected concepts for creating new or expanded markets for farm products can be adopted by farmers and allied industries.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The initial proposal requested funding for five years, from 1988 through 1992.

NONFOOD AGRICULTURAL PRODUCTS, NEBRASKA

Mr. **Whitten**. Please provide a description of the work that has been done under the nonfood agricultural products program to date and the period of the existing contract.

Dr. **Jordan**. CSRS has requested the university to submit a grant proposal. A proposal was received February 1, 1990. It is being reviewed. The application proposes work to identify market niches for products developed from agricultural materials, to improve use of starch in plastic films, extracting oil from crambe and milkweed seeds, improving fermentation process for ethanol production, and administration of the Industrial Agricultural Products Center.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant application begins in fiscal year 1990 and $109,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The University of Nebraska will conduct the work in the Industrial Agricultural Products Center. This Center was established by the Nebraska Board of Regents on May 6, 1988 to broaden markets for agricultural commodities produced in Nebraska.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Successful research, development, and commercialization activities will provide new markets for farmers, diversify the agriculture of Nebraska, use renewable resources more effectively, and provide new and improved products to Americans.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed in fiscal year 1993.

OIL FROM JOJOBA, NEW MEXICO

Mr. WHITTEN. Please provide a description of the work that has been done under the oil from jojoba program to date and the period of the existing contract.

Dr. JORDAN. The fiscal year 1990 grant proposal requested by CSRS has not been received from New Mexico State University. The research plan was approved by CSRS in April 1989 and has not yet concluded the first year. First year milestones are to purify the two enzymes unique to jojoba and responsible for liquid wax production, and develop techniques for gene transfer and stable incorporation into the oilseed rape plant. A report on progress will accompany the continuation grant proposal for fiscal year 1990 funding.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $100,000 under the Supplemental and Alternative Crops program. This research is being funded under the Special Research Grants program in fiscal year 1990 and the appropriation is $148,000. A total of $248,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at New Mexico State University, Las Cruces, New Mexico.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The overall objective is to accumulate high levels of liquid wax esters in the seeds of the agronomic crop rapeseed, Brassica napus, and soybean, Glycine max. This will "create" a new crop of industrial interest for high quality lubricants and cosmetic and pharmaceutical ointments.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The work is anticipated by the Plant Genetics Engineering Laboratory to require a five year research and development project, 1989–1993.

OPERATION SMALL FARM, LOUISIANA

Mr. **Whitten**. Please provide a description of the work that has been done under the operation small farm program to date and the period of the existing contract.

Dr. **Jordan**. CSRS has requested the university to submit a grant proposal that has not yet been received. The concept described to CSRS by Southern University for Operation Small Farm is to provide the public with accurate and sound research applications and demonstrations in the area of small-scale/low-input agricultural enterprises.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. Research supported by this grant begins in fiscal year 1990 with an appropriation of $99,000.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research will be conducted at Southern University, Baton Rouge, Louisiana.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The project is still in preliminary stages. Accomplishments will be reported after the project has been initiated.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. Specific funding information would be available as part of the grant proposal, which has not yet been received.

OREGON/MASSACHUSETTS BIOTECHNOLOGY PARTNERSHIP

Mr. **Whitten**. Please provide a description of the work that has been done under the Oregon/Massachusetts Biotechnology Partnership to date and the period of the existing contract.

Dr. **Jordan**. CSRS has requested that the Partnership submit a grant proposal that has not yet been received. It is our understanding that the proposal will address bioprocessing research using biotechnology.

Mr. **Whitten**. How long has this work been under way and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The initial grant would begin in fiscal year 1990 with an appropriation of $247,000

Mr. **Whitten**. Where will this work be carried out?

Dr. **Jordan**. A grant will be awarded to Oregon State University which will sub-contract with its partners the University of Oregon and the non-profit Massachusetts Centers of Excellence Corporation in Boston, Massachusetts.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. We have not yet received the completed proposal from the Partnership and consequently, we are not prepared to describe the planned work or the expected final outcome.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. We have been told by representatives of the Partnership that it is their plan to propose a five year project.

PEACH TREE SHORT LIFE, SOUTH CAROLINA

Mr. **Whitten**. Please provide a description of the work that has been done under the peach tree short life program to date and the period of the existing contract.

Dr. **Jordan**. Research in fiscal year 1989 on the peach tree short life problem focused on attempts to control the ring nematode through integrated pest management approaches. Significant progress was made in the search for peach rootstocks tolerant or resistant to the ring nematode. Continued progress was made in evaluating orchard ground cover species as a means of suppressing nematode populations. Promising biological control approaches continued to be investigated as another strategy to manage plant-parasitic nematodes. Effects of ring nematodes on the physiology of trees were studied. Recombinant DNA technologies are being used to make a genetic map of the peach, with a view toward locating the nematode resistance locus on the peach genome. The fiscal year 1989 grant supports research through March 1991. The fiscal year 1990 grant proposal has been received and is being reviewed by CSRS.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. Grants have been awarded from funds appropriated as follows: FY 1981, $100,000; FY 1982–1985, $192,000 per year; FY 1986–1988, $183,000 per year; FY 1989, $192,000; FY 1990, $190,000. A total of $1,799,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. The research is being conducted at the South Carolina Agricultural Experiment Station

Mr. **Whitten**. What has been accomplished to date.

Dr. **Jordan**. Several peach rootstock candidates out-performed standard commercial rootstocks. The new candidates are being prepared for larger-scale experiments in a commercial orchard setting. Interplanting the grassy plant nimblewill with peach trees reduced ring nematode populations by more than 50 percent. A naturally-occurring bacterium has been found in peach orchards where short life damage was low. Further greenhouse studies have confirmed that a specific strain of this bacterium greatly reduced ring nematode populations. The specific mode of action by the beneficial bacterium will be determined. Superior peach rootstocks will be identified in research over the next two years.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. South Carolina scientists estimate the work may be completed in fiscal year 1996.

PESTICIDE RESEARCH, WASHINGTON

Mr. **Whitten**. Please provide a description of the work that has been done under the pesticide research program to date and the period of the existing contract.

Dr. **Jordan**. CSRS has requested the university to submit a grant proposal that has not yet been received. This special grant is for Washington, Idaho and Oregon for food quality/pesticide research with Washington State University as the lead organization. The purpose of the research is to ensure the continued availability of pesticides required by producers of crops and animal products in the tri-state region. Objectives include: determine the range of pesticide residue studies needed by producers and processors, with emphasis on regional specialty crops; identify crops and animal products with anticipated critical residue investigations needed in the next five to ten years; project the types of studies needed to control environmental contamination by pesticides; identify development needs, i.e., general laboratory availability, equipment and supplies, operational costs; and identify appropriate support staff requirements.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $49,000.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research will be conducted at Washington State University in cooperation with the University of Idaho and Oregon State University.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The expected final outcome of this project is a report that will address the research objectives identified above.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed.

Dr. **Jordan**. The university researchers anticipate that fiscal year 1990 funding is all that is required in order to complete the objectives of this project.

PESTICIDE CLEARANCE

Mr. **Whitten**. Please provide a description of the work that has been done under the pesticide clearance program to date and the period of the existing contract.

Dr. **Jordan**. The program provides the national leadership, coordination and focal point for obtaining tolerance and safety data for pesticides and biological control agents in specialty crops such as horticultural crops. The need arose because the agricultural chemical industries cannot economically justify the time and expense to conduct the necessary research for pesticides with small market potential. With the Federal registrations resulting from this research, a large number of small-acreage crops such as vegetables, fruits, nuts, spices and other specialized crops have been provided with needed crop protection against pests. Under the auspices of this research program, a group of scientists representing the State and Territorial agricultural experiment stations continually define and update pest control technologies for minor crops needed by farmers, ranchers, and others. Protocols are written after careful review with representatives of grower groups, chemical industry and researchers. The researchers then carry out field trials on many of the highest priority needs to determine their effectiveness, safety and usefulness and thus analyze the field grown commodities, where appropriate, to identify and quantify any residue that may persist. The research program then assimilates the data from all the participating experiment stations, grower groups and chemical industry, and petitions are written for tolerances and Federal registration. The grants awarded in fiscal year 1989 terminate between February 1990 and February 1992. The 1990 grants are currently being processed.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: Program redirection in fiscal year 1975, $250,000; fiscal year 1976, $500,000; fiscal years 1977–1980, $1,000,000 per year; fiscal year 1981, $1,250,000; fiscal years 1982–1985, $1,440,000 per year; fiscal years 1986–1989, $1,369,000 per year; fiscal year 1990, $1,975,000. A total of $19,211,000 has been appropriated.

Mr. WHITTEN. Where is this work carried out?

Dr. JORDAN. Field work is performed at the State and Territorial Experiment Stations. Over the period 1982–1986, the program experienced 100 percent participation by those stations. For the years 1987, 1988 and 1989, 78 percent, 76 percent and 80 percent, respectively of the Agricultural Experiment Stations participated in research projects. Laboratory analysis is conducted primarily at the California, New York, Florida and Michigan Agricultural Experiment Stations with assistance by the Oregon, Hawaii, North Dakota, Arkansas, North Carolina, Virginia, Massachusetts, Pennsylvania and New Jersey Agricultural Experiment Stations. Protocol development, data assimilation, writing petitions and registration processing are coordinated through the New Jersey Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. A total of 895 tolerances for residues of pesticides in minor or specialty food crops have been established. There is a back log of 1,100 State requested research projects on food crops. Additionally, potential re-registration needs and research on alternatives to fill pest management voids corrected by the loss of a pesticide(s) could double the number of researchable food-use projects over the next few years. The annual rate of new pesticide clearance requests received from the States is approximately 200 and an average of 58 pesticide residue tolerances are obtained annually. Six biorational pest controls have received clearance because of this interregional effort. A total of 2,804 labels for use of pesticides on ornamental crops have been issued based on data from this project. A total of 1,274 new regulations requests remain on record; in addition, it is estimated that 1,000 re-registration requests of high priority need to be addressed. New projects are added to this list at a rate of 100 each year and labels have been established at the rate of over 200 per year.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Selected categories of the Special Research Grants program address important national/regional research initiatives. The pesticide clearance program involves research on biological systems that by their nature are ever changing and presenting new challenges to agriculture. Especially with the new sensitivites about food safety and the environment, plus the 1988 amendments to FIFRA regarding re-registration, the workload will probably double. Thus there is a high priority for continuation of these ongoing projects.

PESTICIDE IMPACT ASSESSMENT

Mr. WHITTEN. Please provide a description of the work that has been done under the pesticide impact assessment program to date and the period of the existing contract.

Dr. JORDAN. The National Agricultural Pesticide Impact Assessment Program—NAPIAP—is a coordinating mechanism for USDA and State research activities and information sources which promote informed regulatory decisions on registered, agricultural pesticides. NAPIAP is a multiagency effort that draws on the expertise of nine USDA agencies and their cooperators in State Agricultural Experiment Stations—SAES, Cooperative Extension Services, and State Departments of Agriculture. CSRS-NAPIAP funds together with those of Extension Service have provided support for the participation of 53 States and Territories in this program. SAES scientists have also been funded through CSRS-NAPIAP for research to fill informational needs and for assessment team activity.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: Fiscal years 1977-1981, $1,810,000 per year; fiscal years 1982-1985, $2,069,000 per year; fiscal years 1986-1988, $1,968,000 per year; fiscal year 1989, $2,218,000; per year; fiscal year 1990, $2,437,000. A total of $27,885,000 has been appropriated.

Mr. WHITTEN. Where is this being carried out?

Dr. JORDAN. This work is underway at SAES in 53 States and Territories. Funds for research to fill informational needs are coordinated through a lead State in each region: West—California, North Central—Ohio, Northeast—Pennsylvania, South—Georgia.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research efforts to date have contributed important information on environmental effects, human exposure risks, economic impacts and yield/quality data. Information has been generated which is useful in minimizing potential risks. This includes application technology, pesticide detection methodology, and determination of factors governing environmental fate. Additional regulatory activity associated with re-registration and impacts on nontarget organisms will require increased research on the ramifications of pesticide use. Assessment activity will increase, and an easily accessible data bank must be developed as well as continuously updated to enable the USDA/States to respond to a more rapid regulatory pace.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. Selected categories of the Special Research Grants program address important national/regional research initiatives. The pesticide impact assessment program involves research on biological systems that by their nature are ever changing and presenting new challenges to agriculture. Especially with the new sensitivities about safety and the environment, there is a high priority for continuation of these ongoing projects.

PLASTICS FROM CORNSTARCH, NEBRASKA

Mr. **Whitten**. Please provide a description of the work that has been done under the plastics from cornstarch research program to date and the period of the existing contract.

Dr. **Jordan**. This research represents a totally different approach to making plastics from cornstarch than the technology of using cornstarch in the film to achieve a "biodegradable" plastic. This approach focuses on converting the cornstarch to ethanol by fermentation and then using a direct route to polymers for plastic. The initial focus is on developing technology for the separation/recovery of ethylene. A novel technique—developed at the University of Hawaii-Manoa—is being tested as a means of recovering ethylene, produced from corn, for manufacturing plastics. This approach eliminates the use of energy-intensive distillation.

The fiscal year 1989 grant supports research through May 1990. The fiscal year 1990 grant is currently being prepared by the University of Nebraska.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated for fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 with $40,000. The appropriation for fiscal year 1990 is $39,000. A total of $79,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. The research is being conducted at the University of Nebraska through the Industrial Agricultural Products Center by the Chemical Engineering Department. A close working relationship exists with the University of Hawaii at Manoa.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. In fiscal year 1989, equipment to conduct the work was installed. Equilibrium data were developed, basic parameters tested, and an economic evaluation conducted. Initial results indicate promise.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed.

Dr. **Jordan**. Assuming that the work continues to show promise, this project will require 1 to 2 years of additional research and development work before a commercialization attempt is undertaken in conjunction with the private sector. The research was initiated because of a request from the private firm and that interest continues.

POTATO RESEARCH

Mr. **Whitten**. Please provide a description of the work that has been done under the potato research program to date and the period of the existing contract.

Dr. **Jordan**. Scientists at several of the State Agricultural Experiment Stations in the Northeast, Northwest, and North Central States, are breeding for russet type, high yielding, disease and insect resistant potato cultivars, adapted to the growing conditions in their particular areas, both for the fresh market and for processing. Research is being conducted in such areas as protoplast regeneration, somoclonal variation, storage, propagation, germplasm preservation, and cultural practices. The fiscal year 1989 grants terminate between March 1990 and June 1991. CSRS has requested grant proposals for fiscal year 1990 that have not yet been received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated for fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1983, $200,000; FY 1984, $400,000; FY 1985, $600,000; FY 1986–1987, $761,000 per year; FY 1988, $997,000; FY 1989, $1,177,000; FY 1990, $1,310,000. A total of $6,206,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research work is being carried out at the Cornell, Idaho, Maine, Maryland, Michigan, North Dakota, Oregon, Pennsylvania, and Washington State Agricultural Experiment Stations.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. This research has resulted in a number of new high yielding, excellent quality, disease and insect resistant, russet type cultivars, which are now being used in the processing industry and in the fresh market. Recommendations have been made that have resulted in high quality potatoes that can be stored over long time periods.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate the work will be completed?

Dr. JORDAN. It was originally anticipated these potato projects would be five years in duration.

PRESERVATION AND PROCESSING RESEARCH, OKLAHOMA

Mr. WHITTEN. Please provide a description of the work that has been done under the preservation and processing research program and the period of the existing contract.

Dr. JORDAN. This research is concerned with the nature and extent of losses that occur during harvesting, handling, and processing of vegetables grown in southeastern Oklahoma. Research has been conducted on the effect of various horticultural practices on the biological and physical factors that affect the deterioration of processed fruits and vegetables and the development of new and improved harvesting, handling, and storage technologies, from harvest to consumption of the final product. The fiscal year 1989 grant supports research through March 1991. CSRS has requested the Oklahoma Agricultural Experiment Station to submit a grant proposal for fiscal 1990 that has not yet been received.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1985, $100,000; FY 1986, $142,000; FY 1987, $242,000; FY 1988–1989, $267,000 per year; FY 1990, $264,000. A total of $1,282,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This work is being conducted at the Oklahoma State Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. This research has identified many of the factors responsible for product deterioration, including loss of water, photosynthate, and minerals, type of packaging, and storage conditions. Various food irradiation techniques have been evaluated and published. Computer simulation models have been developed and production budgets analyzed.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate the work will be completed?

Dr. JORDAN. The initial proposal anticipated this project would be completed within a five-year period.

PRIME FARMLAND RECLAMATION, ILLINOIS AND KENTUCKY

Mr. WHITTEN. Please provide a description of the work that has been done under the prime farmland reclamation program to date, and the period of the existing contract.

Dr. JORDAN. Experiments in Illinois are evaluating methods of mine soil reconstruction, soil horizon replacement, and measurement of soil compaction resulting from various reclamation techniques. Productivity of these mine soils are evaluated using corn, soybeans and small grain crops adapted to mid-western agriculture. Fertility experiments are designed to evaluate plant and soil nutrition and response to fertilizer inputs. Compaction amelioration methods are being field tested and evaluated to address the problem of severely compacted mine soils.

Evaluation of the effects that physical and chemical characteristics of reclaimed soils have on return of the productivity of prime farmland continues to be a focal point of research in Kentucky. A major part of these studies is to determine how companies may reduce compaction and how it may be removed if it occurs. Significant improvement in soil properties have been noted where sound reclamation practices were used. Extension of this work to large field scale operators has begun and encouraging results were obtained in 1989. The programs of the two states are being coordinated by joint planning and reporting sessons, and current research activities are being presented to the public through jointly sponsored meetings each February and field days each summer. The fiscal year 1989 grants for Illinois and Kentucky will support research through July 1992 and September 1992, respectively. The fiscal year 1990 grants have not yet been awarded, but preliminary project proposals are being prepared.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: fiscal year 1987, $300,000; fiscal years 1988–1989, $450,000 per year; fiscal year 1990, $543,000. A total of $1,743,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The field research is located on prime farmland in coal fields of the Midwest at locations in southern Illinois and western Kentucky. The associated laboratory research is at the University of Illinois, Urbana, and the University of Kentucky, Lexington.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Experiments have revealed poor plant root system development to be a critical problem on many reclaimed soils. Plant nutrition appears to be affected by soil treatments, and genetic differences in corn varieties affect growth and yield. Fertility data will provide necessary data to use to quantify and adjust fertilizer recommendations for mined land. Early results indicate that deep tillage appears to be a viable option in ameliorating highly compacted soils in Illinois.

Research plots were constructed in Kentucky for deep lime placement, and yield data were collected for grain sorghum and soybeans. Two new field studies are planned in Kentucky with FY 1990 funds, in cooperation with the coal industry. These include an evaluation of organic amendments to subsoil prior to topsoil replacement, and a study of how increasing the earthworm population may improve replaced soils. The former project could provide safe disposal of organic wastes, sewage sludge, and animal wastes and at the same time enhance the productivity of restored soils through complementary additions chemical to fertilizer amendments.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial documentation provided on this grant called for a five-year plan.

REGIONAL BARLEY GENE MAPPING PROJECT

Mr. WHITTEN. Please provide a description of the work that has been done under the regional barley gene mapping program to date and the period of the existing contract.

Dr. JORDAN. This is a new program for fiscal year 1990 which proposes to construct a gene map of important traits in the barley genome. The 1990 grant has not yet been awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $153,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the following locations: Colorado State University; Montana State University; Oregon State University; University of California, Davis: University of Missouri; Virginia Polytechnic Institute and State University; Washington State University; and USDA/ARS Laboratory, Aberdeen, Idaho.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. This project is a cooperative effort among the eight research units previously identified, plus an additional eight U.S. and Canada laboratories not funded by the project. Planning and coordination of the research has already been done. Gene maps will be constructed using RFLP markers for barley DNA. Plants will be field tested to relate genes to plant characters.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The 1990 grant has not yet been awarded. Future research could be proposed under the plant genome mapping project included in the National Research Initiative.

REGIONALIZED IMPLICATIONS OF FARM PROGRAMS

Mr. WHITTEN. Please provide a description of the work that has not been done under the program on regionalized implications of farm programs to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the universities to submit grant proposals. The proposal from Texas A&M University has been received, reviewed, and is being processed for award. The proposal from the University of Missouri has not been received.

The objective of this research is to estimate the impacts of alternative farm and trade policies, such as the 1990 Farm Bill and Uruguay round of trade negotiations, on the economic viability of representative crop and livestock producers located in different regions of the United States.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $346,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted by the Texas A&M University and University of Missouri.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The primary objective is to implement a farm level policy analysis system encompassing major U.S. production regions which interfaces with existing agricultural sector models used for farm, tax and trade policy analysis. With periodic updating of the farm models and data bases for the major crop and livestock commodities, farm groups and policy makers will have a current and relevant analytical tool to assess farm, trade, fiscal, and monetary policy alternatives as policy issues emerge in the future.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers have not identified a specific termination date.

RURAL DEVELOPMENT CENTERS

Mr. WHITTEN. Please provide a description of the work that has been done under the rural development centers program to date and the period of the existing contract.

Dr. JORDAN. The centers for rural development provide assistance in regionally coordinating both research and extension programs in rural and community development at the State land-grant universities. The centers carry out a program of research on regional and multi-state development problems in the rural economy, rural communities, and rural families.

In addition to sponsoring and initiating research by scientists at the various land-grant universities, the centers sponsor research conferences and symposia which assist in the coordination of basic and applied research. The fiscal year 1989 grants terminate between September 1991 and September 1992. The fiscal year 1990 grant proposals have been requested from the participating centers.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1971, $75,000; FY 1972, $225,000; FY 1973, $317,000; FY 1974 through FY 1981, $300,000 per year; FY 1982 through FY 1985, $311,000 per year; FY 1986 through FY 1987, $363,000 per year; FY 1988, $475,000; FY 1989, $500,000; FY 1990, $494,000. A total of $6,456,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The rural development centers are located as follows: Northeast Regional Center for Rural Development, Pennsylvania State University; North Central Regional Center for Rural Development, Iowa State University; Southern Rural Development Center, Mississippi State University; Western Rural Development Center, Oregon State University; and a special project at North Dakota State University. Most of the research sponsored by the four regional centers is actually performed by resident faculty at land-grant universities in the respective region through subcontracts from the center's grant.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The Centers support a range of research on regional affairs. The *Northeast Regional Center for Rural Development*—Pennsylvania State University—did an analysis of the impact of Center moneys on total rural development research investment in the Northeast. They found that each dollar of Center funding leveraged approximately four dollars in other research support from public and private sources. In another study, researchers found that communities which provided a high level of retirement services benefited greatly from government transfer payments made to retirees. Communities that failed to provide services failed to capture income from these sources. The income transfer benefits were widely distributed with a high multiplier effect.

The *Western Rural Development Center*—Oregon State University—recently completed several studies on business development and retention in the West. A public use data base on trade area capture and pull factors for all Western states for the years 1974 through 1986 was created to assist local business planners. Two studies on the potential for high-technology industries in rural areas conclude that high-tech industries provide as much employment as traditional industries and that they generate a stable employment for high skilled and salaried workers.

The *Southern Rural Development Center*—Mississippi State University—continues to focus its program on defining the most significant rural development research priorities across the South. Four task forces have each completed major reports. The task force on "Strategies for Job Creation and Retention" has organized a regional research project to be funded cooperatively by the Agricultural Experiment Stations in the South. The "Alternatives for Financing Economic Infrastructure" task force produced a symposium at which the lead paper documented the facts that there is underinvestment in new infrastructure in the general economy, but the underinvestment is particularly acute in rural areas which generally have the least resources to correct the problem. The Farm and Off-Farm Alternatives for Small-Scale Farmers task force has designed standardized reporting formats to permit effective information exchange on successful strategies for merging on-farm and off-farm entrepreneurial activities to expand family income. The final reports are continuing to influence and redirect rural development research to timely and critical areas.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The rural development centers continue to address needs and issues that are important to their respective constituencies. A specific termination date has not been identified. USDA supports rural development research through Hatch Act and Evans-Allen formula programs and through ongoing work of the Economic Research Service.

RURAL ECONOMIC DEVELOPMENT, GEORGIA

Mr. WHITTEN. Please provide a description of the work that has been done under the rural economic development program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal. The completed proposal is expected this month.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $739,000.

Mr. WHITTEN. Where is the work being carried out?

Dr. JORDAN. Research will be conducted at the University of Georgia.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Since this is a new grant in the pre-proposal stage, accomplishments and progress reports are not yet available.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. In as much as the initial proposal is yet to be received, there is no indication of future funding needs.

RUSSIAN WHEAT APHID

Mr. WHITTEN. Please provide a description of the work that has been done under the Russian wheat aphid program to date and the period of the existing contract.

Dr. JORDAN. Populations of the Russian wheat aphid have been monitored by a network of suction traps in Oregon, Washington, and Idaho. This monitoring allows pest management specialists to alert producers to potential pest populations. Decision criteria based upon damage potential of the aphid to the plant are being used to allow producers to protect yields yet use a minimum of pesticides. Over 20 foreign wheat varieties with genetic resistance to the aphid have been found by Idaho scientists in collections of germplasm from the USDA National Small Grains Repository in Aberdeen, Idaho. Low levels of genetic resistance have been found in three breeding lines from Idaho and the wheat variety, "Treasure".

Five species of parasites have been released in these states and one has been recovered, though permanent establishment or control potential has not been confirmed yet. Four species of pathogenic fungi have been found infecting the pest aphid with as many as 25 percent of the aphids killed in samples. The fiscal year 1989 grants have been awarded and support research through March 1991. Proposals are in preparation for fiscal year 1990 awards.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $100,000. The fiscal year 1990 appropriation is $346,000. A total of $446,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Washington State University, Oregon State University, and the University of Idaho. In fiscal year 1990 research will also be conducted at the University of California.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The affect of environment and aphid reproduction, survival, and population growth will continue to be investigated in cropping systems unique to each state. These data along with seasonal monitoring allow producers to anticipate developing pest populations. Research will be done to confirm data showing the population levels of aphids that plants can tolerate without damage. These data allow growers to use pesticides wisely and minimize the number of applications. This cooperative regional research will continue on importation, release and evaluation of exotic natural enemies, including disease agents, predators and parasites, of the pest. A multi-state program on breeding for resistance will continue to search for resistant germplasm and to incorporate resistant germplasm in commercial cultivars of wheat. A breeding program has been started to improve wheat varieties and incorporate resistance to the aphid pest. Ths multi-state cooperative effort will continue the pest management program to support small grain producers of the Pacific Northwest and California.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed in fiscal year 1993. ARS also conducts Russian wheat aphid research and will devote $1,668,000 to this work in 1990.

SAFFLOWER RESEARCH, NORTH DAKOTA AND MONTANA

Mr. WHITTEN. Please provide a description of the work that has been done under the safflower research program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal, but it has not yet been received. The overall objective and expected final outcome of this safflower research is to enable the northern Great Plains farmers to maintain and expand production of safflower as an alternative crop to cereal grains. Research will be conducted on safflower production for oil and meal, and utilization research in food and non-food systems.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $247,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at the Agricultural Experiment Stations of North Dakota and Montana.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research has not yet begun. Two major interrelated areas to be studied are production systems research and product enhancement research. Germplasm development and evaluation are essential to both expanding safflower production and its product utilization and marketing potential. Research efforts will investigate enhanced field research capabilities and investigate crop rotations within cropping systems, water/nitrogen use and efficiency, crop fertility inter-relationships, weed control, stand establishment, seedling vigor, and plant development to refine safflower production practices and increase safflower germplasm for improved oil content, improved meal protein content, reduced meal fiber content, enhanced oil quality, enhanced meal quality, improved palatability and agronomic adaptability for commercial production in the northern Great Plains.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. In order to complete the objectives of this safflower research, indications are that work may be completed in five years.

SANDHILLS GRAZING MANAGEMENT PRACTICES, NEBRASKA

Mr. WHITTEN. Please provide a description of the work that has been done under the Sandhills grazing management practices program to date and the period of the existing contract.

Dr. JORDAN. The project was developed to study integration of management practices for efficient and profitable cattle production in the Sandhills of Nebraska. Grazing experiments conducted over the past two years have provided plant species composition and yield of herbage biomass. Drought conditions in 1989 resulted in lower total yield and shifts in species composition. New studies provided information on the use of standing dead herbage, the effect of height and frequency of harvest on grass tiller growth and relative utilization of plant species by grazing animals. Animal performance appears best for spring grazing of meadows. The fiscal year 1989 grant supports research through June 1990. The fiscal year 1990 grant has not yet been awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work by this grant began in fiscal year 1988 and the appropriations for fiscal years 1988 and 1989 were $100,000 per year. The fiscal year 1990 appropriation is $99,000. A total of $299,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted by the Nebraska Agricultural Experiment Station at its Gudmundsen Sandhills Laboratory in west central Nebraska.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Grazing studies have been initiated and data collected to evaluate the effect of time and frequency of harvest on productivity and stability of the Sandhills to be used for development of an economic range cattle production model. Measurements have focused on base line data such as plant cover, species composition, biomass production and standing herbage at the beginning and end of the grazing season. Animal performance data suggest spring initiated grazing of meadows gives the best results.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial proposal indicated five years would be needed for this study.

SEAFOOD HARVESTING, PROCESSING, AND MARKETING, MISSISSIPPI

Mr. WHITTEN. Please provide a description of the work that has been done under the seafood harvesting, processing and marketing program to date and the period of the existing contract.

Dr. JORDAN. CSRS has requested the university to submit a grant proposal that has not yet been received. It is anticipated that the research will build on work conducted on the preparation of restructured fish products from mechanically deboned catfish. The grant proposal is currently being prepared. Similar work was funded by a Special Research Grant for food processing in fiscal years 1988 and 1989.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $368,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. The research will be conducted by scientists located in the Department of Food Science and Technology of the Agriculture Experiment Station at Mississippi State University and at the South Mississippi Branch Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. New research under the proposed project will address harvesting procedures, improved processing and methods for extending shelf life of finished products. Additional food and nonfood uses for aquaculture and seafood, including underutilized species such as menhaden, will be studied. Marketing efforts will assess potential consumer acceptance and demand for these products.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the initial proposal, when submitted, will call for a two year plan.

SEEDSTOCKS ENHANCEMENT, NORTH DAKOTA

Mr. WHITTEN. Please provide a description of the work that has been done under the seedstocks enhancement program to date and the period of the existing contract.

Dr. JORDAN. This project is designed to complete development of lines of western wheatgrass, blue grama grass and little blue stem started by the former ARS grass breeders at the Northern Great Plains Research Laboratory. The grant supports a grass breeder position to complete this developmental work and provide improved grass seed varieties for the Conservation Reserve Program acres in the Northern Great Plains. The fiscal year 1989 grant supports research through March 1990. The 1990 grant has not yet been awarded.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $200,000. The fiscal year 1990 appropriation is $197,000. A total of $397,000 has been appropriated.

Mr. WHITTEN. Where is this being carried out?

Dr. JORDAN. Research is being conducted by North Dakota State University at its Mandan Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The first year of this project has advanced the development on new lines of western wheat grass, blue grama and little blue stem grasses. Major effort was concentrated on western wheatgrass and initiation of work on blue gramma grass.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The initial proposal projected five years for completion of this work.

SOIL EROSION RESEARCH IN THE PACIFIC NORTHWEST (STEEP)

Mr. WHITTEN. Please provide a description of the work that has been done to date under the soil erosion research in the Pacific Northwest program, and the period of the existing contract.

Dr. JORDAN. The STEEP Special Research Grant supports research in a three-State multi-disciplinary and multi-agency research program titled, "Solutions to Environmental and Economic Problems: An Erosion Project for the Pacific Northwest." STEEP is an interdisciplinary, multi-agency and multi-state program involving agronomy, soil management, and most other disciplines of agricultural production research such as economics, rural sociology, agricultural engineering, entomology, plant pathology, plant breeding, weed science, soil fertility, and microbiology.

Researchers and Extension counterparts are gaining an improved understanding of the complex nature of erosion control and conservation practices. The difficulties of developing and implementing needed conservation measures to ensure continuation of productive soil resources are much greater for highly erosive nonaggregated soils of the Pacific Northwest. Although a mixture of short- and long-term research has been conducted to provide much needed information, with more to be initiated during FY 1990, adoption of new practices is slow, especially when direct financial gain is marginal. The FY 1989 grants to each state are effective to the following dates: Washington, April 1991; Oregon and Idaho, August 1992. The requests for proposals for the FY 1990 funds to support STEEP programs have been issued. Grants will be made upon receipt and review of these proposals.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The STEEP project has been supported by Special Research Grants for 15 years. Grants have been awarded from funds appropriated as follows: FY 1976, $200,000; FY 1977, $350,000; FY 1978 to 1980, $450,000 per year; FY 1981, $600,000; FY 1982 to 1985, $622,000 per year; FY 1986 to 1989, $591,000 per year; FY 1990, $584,000. A total of $7,936,000 has been appropriated. Funding support also comes from State appropriations, other Federal funding, and private sources.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. It is being done at field sites and laboratories in Idaho, Washington, and Oregon by scientists at the State Agricultural Experiment Stations. Many projects are cooperative with the Agricultural Research Service of UDSA and the Cooperative Extension Service in each State.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Research has shown mixed results as to best practices for erosion control while maintaining satisfactory yields and associated profitability. Conservation farming methods have been improved over the past decade by adoption of STEEP research results through effective associated education programs. New crop and soil management technologies continue to be tested and made available to farmers. The result is that many believe the conservation compliance specifications for some soils can be achieved.

Improved crop resistance to disease, insect, and weed problems resulting from the new management systems is encouraging. A much improved understanding is developing of soil fertility and residue management for successful and economic conservation tillage. Wheat producers are realizing the need for a continual flow of updated information on effective conservation practices for these highly erosive soils, based on current research. The annual STEEP REVIEW documented good progress on new techniques for measuring erosion and perfecting prediction equations. A "Conservation Compliance Calculator" model has been developed to help conservationists design soil management programs. An ultrasonic profiler has been developed to measure soil roughness, which helps to evaluate the effectiveness of different tillage practices that leave a rough surface that is less erosive. Technology transfer methods are being developed for erosion control strategies that integrate complex management and cultural information. Decision-based models or expert systems, incorporating STEEP results, are being developed for use by farmers, SCS, and Extension. The States and agencies involved in STEEP over the past several years have developed plans for continuing to take advantage of the collaborative research and education efforts that have been so very effective in the STEEP process.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The original request for STEEP funding was for 15 years, beginning with fiscal year 1976 and ending in fiscal year 1990.

SOUTHWEST CONSORTIUM FOR PLANT GENETICS AND WATER RESOURCES

Mr. **Whitten**. Please provide a description of the work that has been done under the Southwest consortium for plant genetics and water resources program to date and the period of the existing contract.

Dr. **Jordan**. Research under this program was initiated in fiscal year 1986. A multidisciplinary approach is being used to make advances in biotechnology and related areas with the purpose of improving arid and semi-arid land agriculture. This program has provided a coordinated effort in working to achieve this goal. The fiscal year 1989 grant supports research through September 1990. The 1990 grant has been requested by CSRS, but not yet received.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. Grants have been awarded from funds appropriated as follows: FY 1986, $285,000; FY 1987-1989, $385,000 per year; FY 1990, $380,000. A total of $1,820,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research is being conducted by a consortium of institutions comprised of New Mexico State University, Los Alamos National Laboratory, Texas Tech University, University of Arizona, and University of California at Riverside. New Mexico State University is the lead institution.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. Interdisciplinary research teams have been assembled, a catalog update of researchers and projects was developed, and symposium sponsored. The bulk of the consortium budget, 86 percent, supported basic research at the participating institutions. In 1989, ten research grants were awarded of which seven were renewals and three were new proposals. Work supported wholly or in part by Consortium funds resulted in numerous publications and abstracts, and dozens of presentations at scientific conferences. Results include:

Researchers have identified and isolated the genetic products form Euglena associated with valuable industrial lubricants.

A carbon isotope measurement system has been developed that will help breeders select for more water use efficient plants.

Monitoring key enzymes related to drought tolerance, it has been discovered that PEP carbozylase activity decreases under drought conditions but the protein itself does not thereby allowing the plant to recover quickly from the stress.

Infection of the root surface of nodulating alfalfa and soybean plants with a toxin-producing plant pathogen increases the amount of assimilated nitrogen and yield without causing disease in the plants.

Genes for the enzymes identified during the thermal kenetic window research project have been isloated and transferred to a temperature sensitive crop plant.

A specific metabolic pathway of polyamines was elucidated which correlated to the tolerance of sensitivity of plants under stress.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed in five more fiscal years.

SOYBEAN CYST NEMATODE RESEARCH—MISSOURI

Mr. WHITTEN. Please provide a description of the work that has been done under the soybean cyst nematode research program to date and the period of the existing contract.

Dr. JORDAN. Fiscal year 1989 Special Research Grant funds were made available on a discretionary basis to the Missouri State Agricultural Experiment Station to support research on control of the soybean cyst nematode, SCN. Research supported by fiscal year 1989 CSRS grant funds focused on cultural practices for control of cyst nematode populations, and interactions between cyst nematode damage and other soybean diseases. The fiscal year 1989 grant supports research through March 1992. The fiscal year 1990 grant proposal has been received, and is under review in CSRS.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1979, $150,000; FY 1980-1981, $250,000 per year; FY 1982, $240,000; FY 1983-1985, $300,000 per year; FY 1986-1989, $285,000 per year; FY 1990, $281,000. A total of $3,211,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Missouri Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Preliminary research showed that planting blends of resistant and susceptible cultivars slowed down the shift in gene frequencies of SCN when compared with resistant cultivars planted alone. Difficulties were encountered in obtaining a reliable SCN hatching assay. Sudden death syndrome, SDS, was a serious problem in soybeans last year. Interactions of SDS and SCN damage appeared to vary with soybean field and cultivar. Future research will deal largely with further study of soybean germplasm blends as a method to manage SCN populations. Additional efforts will explore promising leads in establishing a reliable laboratory bioassay for SCN hatching activity. New techniques to screen for sudden death syndrome will be evaluated in order to develop a reliable test procedure.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed in fiscal year 1995.

STONE FRUIT DECLINE, MICHIGAN

Mr. WHITTEN. Please provide a description of the work that has been done under the stone fruit decline program to date and the period of the existing contract.

Dr. JORDAN. Research supported by fiscal year 1989 funds consisted of several coordinated, interdisciplinary thrusts among several departments at Michigan State University. Research efforts consisted of studies on cold injury and bacterial canker; identification of root-related problems; control of *Cytospora* canker of peach; evaluation of harvest systems; applied and basic research on X-Disease and viruses; and design of crop management systems as a basis for grower decision support systems. The fiscal year 1989 grant supports research through September 1990. The fiscal year 1990 grant proposal has been received and is under agency review.

Mr. WHITTEN. How long has this work been underway and how much had been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1985, $300,000; FY 1986-1989, $285,000 per year; FY 1990, $281,000. A total of $1,721,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at the Michigan Agricultural Experiment Station.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Results from research supported by fiscal year 1989 funds covered several diverse but interrelated areas. Rootstock selection for cold hardiness is a major determinant of site selection and cultivar of choice. Ice nucleating bacteria, INA, were found in only one of 32 sweet cherry orchards and 12 of 31 tart cherry orchards during periods when trees were not susceptible to drought. Poor soil structure was found to be the greatest single factor contributing to sour cherry decline. For *Cytospora* canker control, no commercial recommendation can be made at present. A new pad harvest system was developed for young trees. A stone fruit pathogen, tomato ringspot virus, was found to be spread by dagger nematodes. Molecular research involved development of cDNA probes against X-Disease. In cultural systems work, accelerated production of peach seems feasible. New cultivars of plum have been brought into Michigan orchards and they all produced good yields. Future work will be intensified on cold hardiness, root-related problems, cherry and peach cankers, molecular probes for X-Disease, viruses and selected bacteria, and building on the design of grower decision support systems.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed during fiscal year 1992.

STORED GRAIN INSECTS, KANSAS

Mr. WHITTEN. Please provide a description of the work that has been done under the stored grain insects program to date and the period of the existing contract.

Dr. JORDAN. A method of applying grain protectants in a storage bin to only a portion of the grain which is most susceptible to pest outbreak slowed infestations and minimized residues in grain. Alternative application methods for fumigant protectants using a perforated drainage duct in the bottom of large storage units was more effective and minimized worker exposure and fumigant byproduct residues in grain.

Studies of the seasonal biology and time of infestation during the harvest period has provided valuable information that may be used to reduce infestation of stored grain before it goes to the storage bins.

It has been important to provide information to producers on the economics of grain storage and protection relative to current and changing grain quality standards. A price model was used to estimate the implicit "values" of characteristics of wheat which can be interpreted as the discounts for particular quality characteristics in wheat. Preliminary observations indicate that changes in grain standards in May 1988 are having an impact on grain discounts. The data from this research indicate that infestation related discounts levied by country elevators have increased while discounts received by country elevators from terminal elevators have remained relatively stable. The fiscal year 1989 grant supports research through March 1990. The fiscal year 1990 grant is in preparation.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1986–89, $285,000 per year; FY 1990, $281,000. A total of $1,421,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research is being conducted at Kansas State University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Studies that continue in 1990 include: monitoring for pesticide resistance; affects of the grain storage environment and grain cleaning on pests; ecology of the lesser grain borer; and modified methods for application of fumigants and grain protectants.

New studies critical to the changes in grading standards are: to identify types, utilization of, and effectiveness of aeration systems for cooling wheat on Kansas farms; potential for stored-grain insects to infest grain in the field; identification of naturally occurring parasites and predators of stored-grain insects in farm-stored grain in Kansas; and determine the effect of changes in grain standards on elevator discount practices related to insect infestation in wheat.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the work may be completed in fiscal year 1993.

SUBIRRIGATION RESEARCH, MICHIGAN

Mr. WHITTEN. Please provide a description of the work that has been done under the subirrigation research program to date and the period of the existing contract.

Dr. JORDAN. The university has submitted a grant proposal that is being reviewed. The research will focus on development of subirrigation technology that reduces negative impacts of agricultural chemicals on water resources while sustaining productivity.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $62,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. Research will be conducted at Michigan State University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. The anticipated results will lead to the development of subirrigation as a Best Management Practice in terms of productivity, profitability, and the control of environmental impacts.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The university researchers anticipate that the research may be completed in fiscal year 1994.

SUNFLOWER INSECTS, NORTH DAKOTA AND SOUTH DAKOTA

Mr. WHITTEN. Please provide a description of the work that has been done under the sunflower insects program to date and the period of the existing contract.

Dr. JORDAN. The North Dakota and South Dakota Agricultural Experiment Stations continue short and long term research to manage sunflower pests. The fiscal year 1989 grants support research through June 1990 in South Dakota, and March 1992 in North Dakota. The fiscal year 1990 grant proposals have been received and are being reviewed by CSRS.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. Grants have been awarded from funds appropriated as follows: FY 1982, $72,000; FY 1983, $80,000; FY 1984-1985, $150,000 per year; FY 1986-1989, $190,000 per year; FY 1990, $188,000. A total of $1,400,000 has been appropriated. Beginning in FY 1986, approximately 25 percent of the funds have been allocated to South Dakota.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being carried out at the North Dakota and South Dakota Agricultural Experiment Stations.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. North and South Dakota continue research on cultural practices, biological and chemical pesticides, plant resistance, planting dates and plant population variations, and insect behavioral modifying chemicals for the development of an integrated pest management program for sunflower pests.

The chemical basis of red seed weevil attraction to sunflower has shown that male weevils emit a behavioral chemical that is needed for the female to locate sunflower. Male red seed weevils are more attracted to blooming sunflower than to non blooming sunflower. Hexane extracts of males attracted female weevils and hexane extracts of female weevils demonstrated no attractancy. It has been concluded that a male-produced aggregation pheromone plays a major role in sunflower discovery by female weevils. In addition, monoterpenoid mixtures found in sunflower also attract weevils.

An assay was developed to test sunflowers that have been bioengineered to produce the biological insecticide, Bacillus thuringiensis—BT—endotoxin. It has been found that the sunflower moth developed a BT tolerant strain after 8 generations of selective pressure on BT bioengineered sunflower.

Genetic variability as determined by isozyme variability was studied in natural populations of the red and gray sunflower seed weevil from North Dakota to Texas. Fifteen isozyme systems were mostly similar in these populations indicating little genetic variation.

Foliar applications of five insecticides were evaluated for suppression of sunflower damage by insects. Non-treated sunflower had 43.6% achene damage. Of the five insecticides evaluated, lambda cyhalothrin treated sunflower had the lowest achene damage—6.1%. This reduced damage from the controls represents a reduced loss of approximately $60.00 per acre.

Mr. **WHITTEN**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **JORDAN**. The complex of sunflower insect pests continues to be the major problem to sunflower production in the North Central region of the United States. The research program still requires further research to accomplish the goal of reducing the reliance on insecticide controls and becoming an economically viable production system.

TCK SMUT

Mr. **WHITTEN**. Please provide a description of the work that has been done under the TCK smut program to date and the period of the existing contract.

Dr. **JORDAN**. Fiscl year 1989 Special Research Grant funds supported a cooperative research program on TCK smut of wheat involving the State Agricultural Experiment Stations in Idaho, Montana, Oregon, Utah and Washington. During the past year, cooperative research efforts dealt mainly with breeding for smut resistance. Along with this work, considerable effort has been focused on basic genetic studies of wheat germplasm and the smut fungus. Wide-cross and somaclonal techniques have been used to bring together resistance genes from diverse wheat and other small grain germplasm. Increased effort was devoted to fungus eradication in stored grain. The fiscal year 1989 grants terminate between March 1990 and September 1990. The request for proposals has been sent to the five cooperating stations. Research leaders in these states met in late February to develop research plans for the fiscal year 1990 program. When the proposals are received, they will be given expedited review in CSRS.

Mr. **WHITTEN**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **JORDAN**. Grants have been awarded from funds appropriated as follows: FY 1982, $288,000; FY 1983-1985, $361,000 per year; FY

1986, $343,000; FY 1987-1989, $193,000 per year; FY 1990, $247,000. A total of $2,540,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted at State Agricultural Experiment Stations in Idaho, Montana, Oregon, Utah and Washington.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Screening of new wheat progeny for smut resistance has identified additional, superior cultivars for further resistance testing. Genetic studies on the smut fungus have resulted in isolation of virulence genes. Knowing pathogen gene action will be valuable for selecting superior disease resistance, and also in providing breeders with improved predictive tools in estimating future vulnerability of the new wheat cultivars. Additional chemical compounds showed promise for eradicating the smut fungus.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. There are many components and interactions which need to be covered in order to solve problems of TCK smut and it is difficult to determine when the research will be completed.

TROPICAL AND SUBTROPICAL RESEARCH

Mr. WHITTEN. Please provide a description of the work that has been done under the tropical and subtropical research program to date and the period of the existing contract.

Dr. JORDAN. CSRS is operating the program with the advice, planning, coordination and assistance of the Caribbean Basin Advisory Group—CBAG and the Pacific Basin Advisory Group—PBAG. State agricultural experiment stations that are members of CBAG are Florida, Puerto Rico, and the Virgin Islands; members of PBAG are Hawaii and Guam.

The Director-at-Large for the Southern Region who is a member of CBAG and the Director-at-Large for the Western Region who is a member of PBAG also represent non-member institutional interests.

ARS also has representation on CBAG and PBAG. Funds for the program are being divided equally between the two Basin Advisory Groups. The research objective of the program is to improve the agriculture of the subtropical and tropical parts of the United States. Special research grants have been awarded for research on improving pest control of agronomic and horticultural crops; improving the production and quality of tropical fruits, vegetables and agronomic crops; reducing animal diseases and promoting increased beef production through superior pastures; improving agricultural production through better use of land and water resources; and potential for growing new specialty crops.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The operation of the tropical and subtropical research program was transferred from ARS to CSRS, with CSRS funding being first provided in fiscal year 1983. Funds in the amount of $2,980,000 per year were appropriated in fiscal years 1983 and 1984. In fiscal year 1985, $3,250,000 was appropriated. In fiscal years 1986, 1987, and 1988, $3,091,000 was appropriated each year. $3,341,000 was appropriated in fiscal year 1989. The fiscal year 1990 appropriation is $3,299,000. A total of $25,123,000 has been appropriated.

Mr. WHITTEN. Where is this work being carried out?

Dr. JORDAN. This research is being conducted in Florida, Puerto Rico, Virgin Islands, Hawaii, Guam, and California.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. In fiscal year 1989, a total of 84 grants were awarded with 42 grants being awarded through CBAG and 42 grants being awarded through PBAG. Grants were awarded for research mainly in the areas of animal and crop pest protection and productivity and marketing. Research being conducted includes work on biological controls for several harmful insects, orchid production, control of root rots of legumes, increasing crop productivity from tropical soils, marketing of tropical agricultural products and tourism, work on tropical animal diseases, finding better tropical forage legumes for cattle, control for sugarcane insects and diseases, potential for growing various herbs and spices, developing even better disease and heat resistant tomatoes, mineral nutrition of cattle, and irrigation needs and water use of tropical crops.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. The tropical and subtropical program continues to address needs and issues that are important to their respective constituencies. The nature of this program is such that there is a continuing need for research. Grants are funded up to three years with annual funding dependent on satisfactory research progress each year.

WATER MANAGEMENT, ALABAMA

Mr. WHITTEN. Please provide a description of the work that has been done under the water management program to date and the period of the existing contract.

Dr. JORDAN. The research under the "Water Management, Alabama" program has two objectives. They are to develop best management practices for forest and agricultural land; and to determine the movement of agricultural chemicals, nutrients, and animal waste through soils. Research is underway on irrigation on Alabama soils and crops to accomplish these objectives. Basins have been utilized to collect and conserve rainfall. A technique has been developed in this research called "furrow diking", which constructs miniature basins between the rows of crops. The dikes slow down run-off, and form a basin to conserve water when irrigation is utilized. The fiscal year 1989 grant supports research through August, 1991. The fiscal year 1990 grant has not yet been awarded, but a research proposal is already being prepared.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $300,000. The fiscal year 1990 appropriation is $395,000. A total of $695,000 has been appropriated.

Mr. WHITTEN. Whre is this work being carried out?

Dr. JORDAN. Research is being conducted at Auburn University.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Field testing of furrow dikes in the Alabama Water Management Program will commence in Spring, 1990. Method of water application will be included in the study to determine how efficient the dikes are at conserving water and how the method of water application affects the dikes. Additional research will be conducted on the feasibility of establishing irrigation districts and the constraints to controlling the water that flows through the State. Use of the free-flowing water would enhance the irrigation potential of all land.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. JORDAN. It is anticipated that the research will be completed during fiscal year 1993.

WATER QUALITY

Mr. WHITTEN. Please provide a description of the work that has been done to date under the water quality program and the period of the existing contract.

Dr. JORDAN. The FY 1990 funding for Water Quality research in the Special Research Grants program, as a part of the Presidential Initiative on Water Quality, is supporting two types of efforts, including grants to researchers based on a national competition and selection process, and grants to support research of the Midwest Initiative on understanding and evaluating various production practices and crop/soil/chemical systems expected to enhance water quality. The latter program was jointly planned and initiated by CSRS, the State agricultural experiment stations, and ARS, and is being implemented in cooperation with the Extension Service, Soil Conservation Service, U.S. Geological Survey, and other federal and State agencies.

In the national-scope grants program there have been 11 to 14 proposals selected for funding in each CSRS region from the 265 that were submitted, for an award success rate of about 18 percent. Funding levels range from about $65,000 to $150,000 for the total time of the projects, depending on length of time and whether they were single- or multi-institutional. Most awards are for a total of three years. Types of research being funded as problem areas that potentially affect ground water quality are: source, assessment, and prevention of water contamination; irrigation and drainage water management; persistence, disappearance and transport of contaminants; remediation of contaminated soils and water; and economic interpretations of production inputs and outputs.

Mr. WHITTEN. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. JORDAN. The work under the Presidential Initiative on Water Quality begins in fiscal year 1990, and the appropriation for fiscal year 1990 is $6,615,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. **Jordan**. The national-scope competition grants in FY 1990 may be made in any State and are based on selected research problem areas. We are in the final award stage for these grants.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The 1990 awards are for new and expanded research. Planned initiation dates are from April to June 1990 and expectations are for three years duration for most projects. Each year new projects will be selected based on revised lists of eligible priority problems. The intent is to develop a complete understanding of water quality degradation and enhancement processes, and establish a comprehensive data base for models and other decision-aids to be used by Extension, SCS, private advisors and producers. The Midwest Initiative research will provide definitive information on production management systems that are developed from information already available plus results from the new research described above.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The problems of water quality research are complex and many are long-term. To fully evaluate movement of pesticides and their reaction products to ground water aquifers may require several decades. There is a major challenge to researchers for the identification indicators that can predict if and when contamination of aquifers will occur, and how serious the problem will be. It is not possible, either physically or financially, to conduct research for all the conditions of soils, crops, chemical use, climate, irrigation, etc. that exist in this country.

Therefore, gaining an understanding of basic principles controlling contamination and remediation processes, and developing an adequate data base to enable transfer of technology to other conditions is of utmost importance. Many of these basic studies will be of three to five years duration. Longer-term research involving crop sequences and other management changes will require 12 to 15 years to obtain definitive results. Movement of pesticides through soils and overburden above aquifers will require 10 to 50 years to measure. In addition, we believe that a mix of applied research and large scale testing, concentrated in geographic settings such as the Midwest Initiative can effectively evaluate agricultural production systems for their ability to enhance water quality. The total time for these steps could be many years, but this can be shortened by focusing research activities and by maximizing cooperative planning and implementation of comprehensive programs, with other agencies and governments.

WHEAT GENETICS, KANSAS

Mr. **Whitten**. Please provide a description of the work that has been done under the wheat genetics program to date and the period of the existing contract.

Dr. **Jordan**. This project is designed to collect, maintain, evaluate, and document genetic resources of exotic wheat related germplasm; develop genetic and cytogenetic stocks from wild species for use by public, private and international organizations to produce improved wheat cultivars. The fiscal year 1989 grant supports research through April 1990. The fiscal year 1990 grant has not yet been awarded.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant began in fiscal year 1989 and the appropriation for fiscal year 1989 was $100,000. The fiscal year 1990 appropriation is $99,000. A total of $199,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research is being conducted at Kansas State University by the Wheat Genetics Resource Center.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. This project has provided supplemental support to State and private contributions to enhance the collection and characterize and catalog genetic material and make it available to wheat researchers.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. The initial proposal did not specify the number of years funding would be needed. Programs to preserve and characterize wheat germplasm and other important germplasm are conducted on a national basis through ARS.

WOOD UTILIZATION RESEARCH

Mr. **Whitten**. Please provide a description of the work that has been done under the wood utilization research program to date and the period of the existing contract.

Dr. **Jordan**. The results of the work being accomplished and the studies underway have been documented in two publications: "Advanced Technology Applications to Eastern Hardwood Utilization," Department of Forestry, Michigan State University and "Center of Wood Utilization Research—Progress Report for 1989," Forest Research Laboratory, Oregon State University. In addition, a research report published by the Mississippi Forest Products Laboratory entitled "Furniture Manufacturing and Marketing in the American Economic Transition" detailed the problems and possible solutions occurring in this fastest growing segment of the Mississippi economy. Each of the participating laboratories are examining the safety issue. For example, the Oregon State University program has addressed logging safety and produced a series of laminated 3 by 5 cards to be carried by workers for review prior to beginning the work day at the logging show.

The fiscal year 1989 grants terminate between January 1990 and March 1993. The fiscal year 1990 grants are in the award process.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. Grants have been awarded from funds appropriated as follows: fiscal year 1985, $3,000,000; fiscal year 1986 through fiscal year 1989, $2,852,000 per year; and fiscal year 1990, $2,816,000. A total of $17,224,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Three Universities have principal responsibility for the program. Oregon State University, College of Forestry, has research ongoing in the western conifers; Mississippi State University, School of Forest Resources, is working with southern pines; and Michigan State University, Department of Forestry, is coordinating research dealing with eastern hardwoods in cooperation with researchers in seven other universities.

Mr. WHITTEN. What has been accomplished to date?

Dr. JORDAN. Composite materials that include wood or wood fiber as a portion of the matrix hold great promise as replacement materials for metal panels and construction. Studies have shown that composites containing wood fibers can replace other materials in portions of automobiles. Properties of concrete products are improved through the addition of wood fiber. As the nation's manufacturers learn to exploit the properties of composites and the wood-based producers assimilate the results of studies of these engineered materials, the wood industry may benefit as it recognizes increased markets for composites. Safety has always been a concern of the wood industry. An ongoing study is relating wood frame construction and occupant safety in relation to fire. Harvesting safety continues to be a major research item in all three regions.

Presently approximately eighty studies are in various phases from start to completion. A seminar is scheduled for May 30-31, 1990, in which many of the eastern hardwood studies will be discussed. Another meeting in early fall is being planned to collate the results and examine the direction of the research dealing with Automated Lumber Processing—ALPS. There are many studies planned, the issue is the setting of priorities among them.

Mr. WHITTEN. When do the principal researchers carrying out this work anticipate the work will be completed?

Dr. JORDAN. The wood utilization program continues to address needs and issues that are important to their respective constituencies. The nature of the program is such that there is a continuing need for research support. Major support for wood utilization research is provided through the McIntire-Stennis formula program and the Forest Service research program.

WOOL RESEARCH, TEXAS

Mr. WHITTEN. Please provide a description of the work that has been done under the wool research program to date and the period of the existing contract.

Dr. JORDAN. The purpose of this research is to develop objective measures of wool and mohair to increase profitability of the sheep and Angora goat industries. Numerous scientific and technical papers were published during FY 1989. Experimental work was conducted in the following areas: selection for fine fiber in Angora goats; tolerance levels for medullated fibers in mohair; effects of nutrition on mohair production; short-shorn wool for use in fiber blends; effects of shearing method and skirting technique on quality, quantity and value of wool. The FY 1989 grant supports research through August 1990. A grant proposal is being prepared for FY 1990.

Mr. WHITTEN. How long has this project been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. Grants have been awarded from appropriated funds as follows: FY 1984–1985, $150,000 per year; FY 1986–1989, $142,000 per year; FY 1990, $144,000. A total of $1,012,000 has been appropriated.

Mr. **Whitten**. Where is this work being carrried out?

Dr. **Jordan**. The research is in progress at the Texas Agricultural Experiment Station.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. Evaluation of the Peyer Texlab FDA200 System for measuring fiber diameter distributions was completed following a series of tests involving the laboratory in Texas and three overseas testing labs. The FDA200 instrument produced accurate, rapid fiber measurements for wool, mohair and cashmere. An automatic image analysis system is currently being evaluated for rapid measurement of the following fiber characteristics; average diameter, medullation, scoured color, colored fibers and staple crimp. Progress in these areas is now dependent upon the development of satisfactory software to accompany the hardware that has been assembled.

The following cooperative experiments are also in progress: performance testing of sheep and Angora goats; selection and breeding experiments with sheep, and Angora and cashmere goats; environmental effects on mohair production; nutritional effects on the quality and quantity of mohair produced by Angora goats; effects of shearing method and skirting technique on the quantity, quality and value of wool from finewool sheep; and effect of clip preparation and marketing on the quality and value of mohair.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. This wool research program at San Angelo, Texas, represents the only major research effort of this type in the United States. No specific time-frame for research was identified in the original proposal.

WORLD FOOD SYSTEMS, INDIANA AND OHIO

Mr. **Whitten**. Please provide a description of the work that has been done under the world food systems program to date and the period of the existing contract.

Dr. **Jordan**. The grants are facilitating research being conducted under Hatch Regional Project NC-194, "The Organization and Performance of World Food Systems: Implications for U.S. Policies". Grant funding has been used to assemble a group of research personnel with unique expertise in analyzing the performance of firms and industries in international markets. These researchers are: investigating factors that affect the competitiveness of U.S. firms in world markets for high-value and value added agricultural products; conducting research on how the structure of industries, the behavior of firms therein, and related public policies affect competitiveness and other aspects of international market performance; facilitating and coordinating related research being conducted by participating institutions; integrating the findings of project participants and drawing general conclusions and implications; and maintaining, updating, and coordinating the overall regional project work plan. The fiscal year 1989 Ohio grant supports research through December 1989 and the Indiana grant supports research through February 1990. The 1990 grants are currently being processed.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by these grants began in fiscal year 1989 and the appropriation for fiscal year 1989 was $300,000. The fiscal year 1990 appropriation is $355,000. A total of $655,000 has been appropriated.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Jordan**. Research is being conducted at Purdue University and Ohio State University.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. The project leaders at Ohio State and Purdue Universities have been instrumental in developing and organizing the Hatch regional research project NC-194. The project's core group of researchers at Ohio State University is developing an international market data system on trade flows of high-value and value-added agricultural products and on the organization and behavior of firms and industries involved in such markets; examining determinants of international trade in food and other processed agricultural products; identifying and investigating methods of international coordination among suppliers and marketers; and investigating firm and industry characteristics that affect export performance. Findings thus far have identified factors such as firm size, market concentration, product differentiation, ownership structure, and product and geographic specialization that explain about 40 percent of the variability in export propensity among U.S. food processing industries. Researchers at Purdue University are examining both in- and out-bound foreign direct investment by food processing firms and assessing the impacts of factors such as scale economies and seller concentration on international trade and differentiated agricultural products. Groups of participating researchers have begun to examine linkages from the U.S. food manufacturing and agricultural processing industries to European Community and Pacific Rim countries; and international assembling of data, contracting, and other vertical coordination arrangements.

Mr. **Whitten**. When do the principal investigators carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. These grants support the core group of researchers that facilitate, coordinate and enhance the research being conducted under the Hatch regional project NC-194. The regional research project was approved October 1, 1988 and is currently due to terminate September 30, 1993.

YOUTH SCIENCE CAMP PROGRAM

Mr. **Whitten**. Please provide a description of the work that has been done under the youth science camp program to date and the period of the existing contract.

Dr. **Jordan**. The Youth Science Camp Foundation has been providing science education in an isolated retreat setting for twenty-five years. It is their intention, in partnership with West Virginia University, to engage in curriculum research to identify ways to develop programs that will increase the impact of science education on the students that are drawn from every state to participate in their program.

Mr. **Whitten**. How long has this work been underway and how much has been appropriated through fiscal year 1990?

Dr. **Jordan**. The work supported by this grant begins in fiscal year 1990 and the appropriation for fiscal year 1990 is $74,000.

Mr. **Whitten**. Where will this work be carried out?

Dr. **Jordan**. In cooperation with West Virginia University, research will be conducted at the site of the National Youth Science Camp in northern Pocahontas County, approximately five miles from Bartow, West Virginia.

Mr. **Whitten**. What has been accomplished to date?

Dr. **Jordan**. It is intended, that by using state-of-the-art science facilities, research on teaching methodology in a remote residential setting will result in a more effective curriculum that will promote scientific leadership and cultivate a life long desire to pursue scientific excellence.

Mr. **Whitten**. When do the principal researchers carrying out this work anticipate that the work will be completed?

Dr. **Jordan**. It is anticipated that the work should be completed during fiscal year 1991.

FIRE ANTS

Mr. **Whitten**. What Hatch Act or McIntire-Stennis funds will be devoted to the fire ant program during fiscal years 1989, 1990 and 1991?

Dr. **Jordan**. Approximately $18,000 of the Hatch Act funds will be devoted to the fire ant program during fiscal years 1989, 1990 and 1991. In addition, there will be about $45,000 of Special Research Grants funds in 1989 and 1990.

Mr. **Whitten**. What types of work are underway and where is the work carried out?

Dr. **Jordan**. Several researchers at State Agricultural Experiment Stations in Georgia, Hawaii, and South Carolina are evaluating insecticide controls for the fire ant. Formulations being evaluated are commercially available insecticide baits, drenches and granules.

The Texas Agricultural Experiment Station is doing basic studies on the nucleaic DNA content of fire ants. Significant and predictable DNA content differences have been found between 5 fire ant species. The most extreme variation of DNA content occurs in a fire ant population in Walton County, Georgia. Investigators at the Georgia Agricultural Experiment Station have found multiple-queen colonies from the same species. Also, hybrid species have been found in Georgia. Studies at Texas have shown that the multiple queen forms are more difficult to eliminate with a bait or drench than the single queen forms. Also male production is very low in multiple queen colonies and most of the males that are produced are sterile. The Georgia Agricultural Experiment Station is determining the extent of genetic diversity to understand the spread and current distribution of fire ants.

The Georgia Agricultural Experiment Station is also studying the effects of pheromonal inhibition on virgin female fire ants. Mated queens have been found to produce a pheromone that prevents workers from rearing male and female reproductive forms.

PINE BARK BEETLE

Mr. WHITTEN. What Hatch Act or McIntire-Stennis funds will be devoted to the pine bark beetle during fiscal years 1989, 1990, and 1991?

Dr. JORDAN. Approximately $150,000 of Hatch Act and McIntire-Stennis funds will be devoted to the Southern pine bark beetle during fiscal years 1989, 1990, and 1991. In addition there will be about $68,000 of Special Research Grants funds in each of these years.

Mr. WHITTEN. Please describe what work is underway and at what locations?

Dr. JORDAN. Researchers at the Mississippi Agricultural Experiment Station have demonstrated that fungi associated with the Southern pine bark beetle produce compounds called isocoumarins that may be instrumental in killing Southern pine trees by interfering with the internal water processes. In addition, it has been learned recently that dying trees produce ultrasonic acoustic emissions—AEs—when water stressed. These ultrasonic acoustic emissions are produced as a result of the breakage or cavitation of water columns in their water-conducting tissues. Research at the North Central Forest Experiment Station in Minnesota, supported under a Special Research Grant, is determining if bark beetles are attracted to objects that are pulsed with ultrasound. To date it has been determined that ultrasonic acoustic emissions from white pine, oak, maple, and birch potted seedlings when water stressed emit ultrasonic acoustic emissions between 20 and 300 kHz. A great deal of information is known about olfactory detection in Southern pine beetles and this information has been put into practice for management of Southern pine beetles. Knowledge about ultrasonic acoustic emissions and response by Southern pine beetles would be equally important. For instance, the Texas Agricultural Experiment Station has demonstrated through single cell recordings that there are a variety of olfactory neurons in the antennae with differential behavioral chemical spectra. Some olfactory neurons are specific for single compounds—finely tuned—and others are specific for a number of compounds—broadly tuned. Five Southern pine bark beetle species often co-exist and compete for resources in the same host trees. The orchestration of host selection, aggregation and colonization by these guild species is accomplished by a chemical communication system composed of both intra- and inter-specific chemical messengers. Researchers at the Virginia Agricultural Experiment Station, investigating this communication system at the receptor and behavior levels, have determined that each species possesses receptors with lower thresholds and in greater abundance for the compounds they produce and to which they are behaviorally most responsive. Past research has clearly provided the methodology for detecting areas of pine bark beetle outbreaks whereby the mobilization of resources can be focused on eliminating the spread of the infestation. Trap trees, baiting, and the use of pheromones have been demonstrated to be practical approaches to reducing the spread of outbreaks. Additional information on pine bark beetle communication mechanisms will add to the capability to manage pine bark bettle infestations.

ANIMAL HEALTH AND DISEASE RESEARCH

Mr. WHITTEN. Please describe for the record how the $5,476,000 appropriated in fiscal years 1988, 1989 and 1990 has been used for the animal health and disease program.

Dr. JORDAN. Formula funds appropriated for the Animal Health and Disease Section 1433 Research Program were distributed to all eligible institutions in 1988, 1989, and 1990. This included the fifty states and Puerto Rico through the Agricultural Experiment Stations and the Schools or Colleges of Veterinary Medicine which have the capacity to do Animal Health and Disease Research. The scope of the research which was presented in the institutional plan of research is quite broad. It includes research to promote the general welfare through improved health and productivity of domestic livestock, poultry, aquatic animals, and other income-producing animals which are essential to the nation's food supply and the welfare of producers and consumers of animal products. Approximately 500 projects are being supported by Section 1433 funds.

Mr. WHITTEN. Please provide a table for the record showing funding by location.

[The information follows:]

Distribution of Funds for Animal Health and Disease Research
Section 1433, P.L. 95-113
(In Dollars)

State/Recipient	Fiscal Year 1989 Actual	Fiscal Year 1990 Est.
ALABAMA		
Agricultural Experiment Station, Auburn University	$59,229	$51,862
School of Veterinary Medicine, Auburn University	46,277	51,578
School of Veterinary Medicine, Tuskegee University	5,220	6,241
ALASKA		
Agricultural Experiment Station, University of Alaska	11,937	8,316
ARIZONA		
Agricultural Experiment Station, University of Arizona	59,201	56,856
ARKANSAS		
Agricultural Experiment Station, University of Arkansas	73,641	79,070
CALIFORNIA		
Agricultural Experiment Station, Univ. of California, Berkeley.	226,815	225,008
School of Veterinary Medicine, University of California, Davis.	158,598	144,757
COLORADO		
Agricultural Experiment Station and College of Veterinary Medicine, Colorado State University	241,605	232,005
CONNECTICUT		
Agricultural Experiment Station, Univ. of Connecticut, Storrs	22,604	21,712
DELAWARE		
Agricultural Experiment Station, University of Delaware	18,703	19,086
FLORIDA		
Agricultural Experiment Station, University of Florida	82,451	73,910
College of Veterinary Medicine, University of Florida	84,503	90,951
GEORGIA		
Agricultural Experiment Station, University of Georgia	21,133	22,819
College of Veterinary Medicine, University of Georgia	118,666	117,567
HAWAII		
Agricultural Experiment Station, University of Hawaii	7,992	7,694
IDAHO		
Agricultural Experiment Station, University of Idaho	44,042	42,004
College of Veterinary Medicine, University of Idaho	23,398	15,967
ILLINOIS		
Agricultural Experiment Station and College of Veterinary Medicine, University of Illinois	163,163	148,954
INDIANA		
Agricultural Experiment Station and School of Veterinary Medicine, Purdue University	100,047	99,442
IOWA		
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	48,065	47,288
College of Veterinary Medicine, Iowa State University	227,293	217,034
KANSAS		
Agricultural Experiment Station and College of Veterinary Medicine, Kansas State University	169,149	174,726
KENTUCKY		
Agricultural Experiment Station, University of Kentucky	90,699	88,571
LOUISIANA		
Agricultural Experiment Station, Louisiana State University	62,751	61,544
School of Veterinary Medicine, Louisiana State University	27,177	32,503
MAINE		
Agricultural Experiment Station, University of Maine	16,254	16,114
MARYLAND		
Agricultural Experiment Station, University of Maryland	45,714	42,936
MASSACHUSETTS		
Agricultural Experiment Station, University of Massachusetts	13,792	12,038
School of Veterinary Medicine, Tufts University	28,419	18,420
MICHIGAN		
Agricultural Experiment Station and College of Veterinary Medicine, Michigan State University	97,935	96,709
MINNESOTA		
Agricultural Experiment Station, University of Minnesota	87,540	85,055
College of Veterinary Medicine, University of Minnesota	83,945	84,181
MISSISSIPPI		
Agricultural and Forestry Experiment Station and College of Veterinary Medicine, Mississippi State University	69,522	74,655

State/Recipient	Fiscal Year 1989 Actual	Fiscal Year 1990 Est.
MISSOURI		
Agricultural Experiment Station, University of Missouri	$44,426	$51,008
College of Veterinary Medicine, University of Missouri	126,797	110,185
MONTANA		
	79,449	71,819
NEBRASKA		
Agricultural Experiment Station, University of Nebraska	177,438	174,905
NEVADA		
Agricultural Experiment Station, University of Nevada	23,276	24,042
NEW HAMPSHIRE		
Agricultural Experiment Station, University of New Hampshire ..	9,698	9,907
NEW JERSEY		
Agricultural Experiment Station, Rutgers University	21,747	25,138
NEW MEXICO		
Agricultural Experiment Station, New Mexico State University ..	38,618	38,248
NEW YORK		
Agricultural Experiment Station, Cornell University	70,579	72,277
College of Veterinary Medicine, Cornell University	226,462	224,742
NORTH CAROLINA		
Agricultural Experiment Station and School of Veterinary Medicine, North Carolina State University	111,112	116,107
NORTH DAKOTA		
Agricultural Experiment Station, North Dakota State University	55,690	54,307
OHIO		
Ohio Agricultural Research and Dev. Center, Ohio State Univ. ..	82,326	84,923
College of Veterinary Medicine, Ohio State University	29,447	27,842
OKLAHOMA		
Agricultural Experiment Station and College of Veterinary Medicine, Oklahoma State University	109,810	113,621
OREGON		
Agricultural Experiment Station, Oregon State University	55,257	62,027
School of Veterinary Medicine, Oregon State University	36,832	28,252
PENNSYLVANIA		
Agricultural Experiment Station, Pennsylvania State Univ.	68,435	67,229
School of Veterinary Medicine, University of Pennsylvania	79,150	81,048
PUERTO RICO		
Agricultural Experiment Station, University of Puerto Rico	12,385	12,925
RHODE ISLAND		
Agricultural Experiment Station, University of Rhode Island ...	6,599	7,361
SOUTH CAROLINA		
Agricultural Experiment Station, Clemson University	21,600	22,168
SOUTH DAKOTA		
Agricultural Experiment Station, South Dakota State University	89,816	91,275
TENNESSEE		
Agricultural Experiment Station and College of Veterinary Medicine, University of Tennessee	66,245	66,684
TEXAS		
Agricultural Experiment Station and College of Veterinary Medicine, Texas A&M University	367,752	374,727
UTAH		
Agricultural Experiment Station, Utah State University	45,277	44,946
VERMONT		
Agricultural Experiment Station, University of Vermont	17,627	16,798
VIRGINIA		
Agricultural Experiment Station and College of Veterinary Medicine, Virginia Polytechnic Institute and State Univ.	98,668	108,138
WASHINGTON		
Agricultural Experiment Station, Washington State Univ.	41,618	40,915
College of Veterinary Medicine, Washington State Univ.	91,277	96,656
WEST VIRGINIA		
Agricultural & Forestry Experiment Station, West Virginia Univ.	12,579	11,933
WISCONSIN		
Agricultural Experiment Station and College of Veterinary Medicine, University of Wisconsin	192,830	184,186
WYOMING		
Agricultural Experiment Station, University of Wyoming	42,946	41,924
Subtotal	5,191,248	5,125,836
Federal administration	219,040	216,280
Small Business Act	65,712	64,884
Total	5,476,000	5,407,000

ANIMAL HEALTH AND DISEASE RESEARCH

Mr. **Whitten**. In fiscal year 1991 you propose to terminate this program. What is the basis for proposing this termination?

Dr. **Jordan**. The Animal Health and Disease Research program has provided funds on a formula basis for livestock and poultry disease research at accredited colleges of veterinary medicine and State Agricultural Experiment Stations. Research formerly conducted under this program may be continued under the expanded Animal Systems component of the National Research Initiative. The National Research Initiative will better target funds to projects of highest scientific merit and most closely tied to national priorities. A consolidated animal health program will provide a focus for innovative approaches to solving fundamental problems in animal health and disease in food and fiber animals.

FEDERAL ADMINISTRATION

Mr. **Whitten**. Would you please provide for the record an object classification table for Federal administration, including all funds available for that purpose, for fiscal year 1989, 1990, and 1991?

[The information follows:]

COOPERATIVE STATE RESEARCH SERVICE—CLASSIFICATION BY OBJECTS FOR FEDERAL ADMINISTRATION FUNDS FY 1989 AND ESTIMATED 1990 AND 1991

[In thousands of dollars]

	1989	1990	1991
Personnel compensation:			
11 Total personnel compensation	$5,351	$5,834	$6,823
12 Personnel benefits	798	881	1,033
13 Benefits for former personnel	6	5	5
Total personnel compensation and benefits	6,155	6,720	7,861
Other objects:			
21 Travel	855	921	1,074
22 Transportation of things	16	17	20
23 Communications, utilities and misc. charges	414	431	494
24 Printing and reproduction	181	194	208
25 Other services	4,085	5,194	2,478
26 Supplies and materials	185	192	218
31 Equipment	439	239	276
41 Grants, subsidies, and contributions	4,909	11,799	10,670
Total, other objects	11,084	18,987	15,438
Total direct obligations	17,239	25,707	23,299

OTHER SERVICES ACCOUNT

Mr. Whitten. In reviewing the Federal Administration object classification table which appears on page 393 of Part 2 of last year's hearings, we note that between fiscal years 1989 and 1990 you show approximately a 50 percent decrease in the Other Services account, going from $3,685,000 in 1989 down to $1,688,000 in 1990. What was the reason for this decrease in the Other Services account of over 50 percent in one year?

Dr. JORDAN. The CSRS budget reduction of $53,329,000 between the fiscal year 1989 appropriation and the fiscal year 1990 budget request resulted in a reduction of $1.9 million for Federal administration. It was necessary for CSRS to maintain its salary costs and other related expenses needed to support the requested 160 staff-years. In order to absorb the cut in Federal administration we were proposing to reduce the services performed under object class 25, "Other Services". As a result of the fiscal year 1990 appropriation the Other Services estimate was not reduced.

HONORARIA

Mr. WHITTEN. How much did CSRS pay out in honoraria in fiscal years 1988 and 1989?

Dr. JORDAN. CSRS honoraria costs were $73,600 in fiscal year 1988 and $63,000 in fiscal year 1989.

Mr. WHITTEN. Who was the single largest recipient each year?

Dr. JORDAN. In fiscal years 1988 and 1989, non-Federal scientists serving on CSRS peer panels received $100 per day for every day that the panel met, which usually ranged from one to four days depending on the number of proposals submitted under the program. I will provide a table for the record showing how much honoraria was paid under each CSRS program that required peer panels to review competitively awarded grant proposals.

[The information follows:]

CSRS PEER PANEL HONORARIA COSTS

	Fiscal year 1988	Fiscal year 1989
Higher Education Graduate Training Grants	$5,700	$5,700
Rangeland Research Grants	1,000	800
Special Research Grants (Animal Health, Aquaculture)	12,200	10,200
Competitive Research Grants	50,200	41,000
Small Business Innovation Research Grants	4,500	5,300
Total	73,600	63,000

Mr. WHITTEN. Mrs. Smith.

NATIONAL RESEARCH INITIATIVE

Mrs. SMITH. Thank you.

Welcome, Dr. Jordan, welcome, Dr. Hess. Mr. Dewhurst, we see him every day, and we're always glad to see him again.

I'm sorry about all this, but we had to vote, and I had to stop on the way up and talk about crop insurance with some people from my district that had an appointment.

I was very much interested in your report, Dr. Jordan. Yesterday, you discussed the President's research initiative, and I know that you've discussed it a good deal today. I've been listening very closely.

I understand that you folks have been playing a very important role in coordinating this proposal. How do the various commodity, environmental, and consumer groups feel about this initiative?

Dr. JORDAN. I'm glad you asked that, Congresswoman Smith, because they have been involved from the very beginning of laying out the plan to be sure that we came up with a program plan that met their real needs and to use the various tools that have been made available to us, the formula program, or the special research grants program, or the competitive grants, and fit them in correctly in that total layout.

They have been very, very supportive of it, and, in fact, as you look on the program plan on pages 12 and 13, you'll see most of the major commodity groups in the United States represented there. Also, most of them have signed on to CARAFE, the Coalition for the Advancement of Research in Agriculture, Food and the Environment.

Mrs. SMITH. Now, how do you think that $100 million initiative is going to contribute to getting more qualified young scientists ready to meet tomorrow's challenges?

Dr. JORDAN. The initiative will contribute in two important ways. One is that as a part of conducting this research, the institutions that are funded will undoubtedly depend to a significant extent on graduate students to conduct and assist in the research.

The second way is that we hope through the institutional strengthening grant program to bring along institutions that need to attract students to agriculture by making them part of this core that brings more interested students into the agricultural sciences and by putting them on the cutting edge.

So the real thing that's going to attract them, I think, Mrs. Smith, is going to be that agricultural research scientists are doing the cutting edge science, no matter what discipline may be involved.

VALUE ADDED PRODUCTS

Mrs. SMITH. You know, Dr. Jordan, and all of you, there's a growing concern about the fact that we are becoming the world's supplier of raw commodities, and we send them abroad, and they're made into high value products and provide jobs for foreign workers, and we lose jobs, so they send them back.

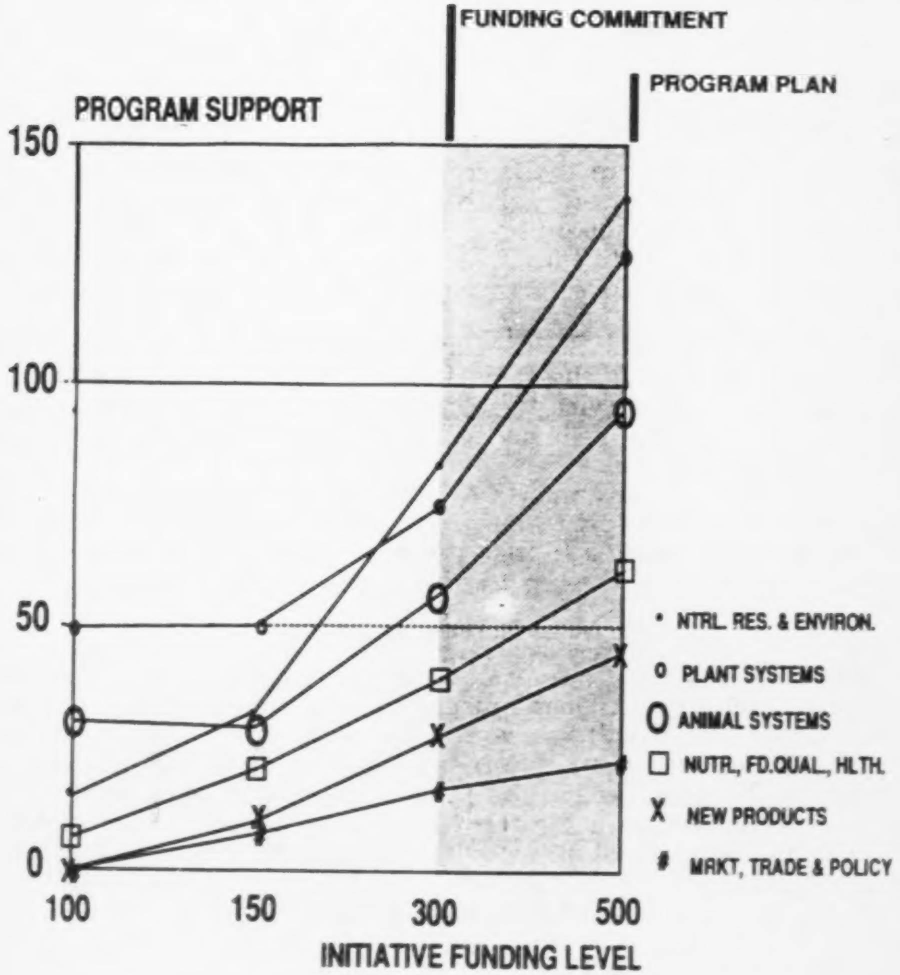
To ensure our competitiveness in the world's food market, it seems to me that we ought to be focusing more than we are on a science and technology that leads to value added products.

It seems to me we have a real shortage of trained food scientists who can address food safety and adding value to these crops.

I'm concerned, really, as I look at this budget, this $100 million, and I see you have $50 million for plant systems, and $30 million for animal systems, which I don't object, but nothing for new products or new processes or research to add value to raw products, nothing for markets in trade and policy.

It seems to me that we ought to be thinking more about some of these other areas.

Dr. JORDAN. We agree 100 percent with you, and as you look at the chart on the back page of the program plan that has a scale-up of the program, it will show you that the value added research is the next area to come on line.


FUNDING COMMITMENT
PROGRAM PLAN
PROGRAM SUPPORT
150
100
50
0
100
150
300
500
INITIATIVE FUNDING LEVEL
• NTRL. RES. & ENVIRON.
o PLANT SYSTEMS
O ANIMAL SYSTEMS
□ NUTR., FD.QUAL., HLTH.
X NEW PRODUCTS
# MRKT, TRADE & POLICY

Dr. **Jordan**. It is important, and what we're saying is that there's a continuum from very basic and fundamental questions all the way through to the finished product and moving it into the market place.

The reason why it doesn't show in the first $100 million is that we have folded in animal health, we have folded in all the competitive research grants in the current program, so there's a base program to be looked after, and that accounts for the approximately $50 million of that $100 million.

Our objective was to fund what we're working on right now adequately, and then move to the next level and fund it adequately, too.

Dr. **Hess**. Also, Mrs. Smith, I might mention that, as you look at the overall budgets in the Department, Congress directed the Agricultural Research Service to redirect $50 million into new product development in the 1990 budget, and Dean Plowman is working currently on that area.

We do view it as an important area. We would like to see eventually the competitive program also invest a greater investment, because we agree with you that it's a very important area for our competitiveness and the health of American agriculture.

PSEUDORABIES RESEARCH

Mrs. **Smith**. Well, I appreciate your explanation very much. I'm not sure I buy it, but let me just ask one more question, and since the hour is late, I will ask you to put your answer in the record.

I'm very pleased about the research being conducted at the University of Nebraska regarding pseudorabies, and I'd be so glad for you to further explain for the record why it's so needed and the results you have found and why they are so important to the swine industry.

So thank you both very much for being here.

Mr. Chairman, thank you.

[The information follows:]

Pseudorabies Research

Since our knowledge of pseudorabies or Aujeszky's disease genetics is minimal, the research was initiated to determine which genes in pseudorabies virus are responsible for its ability to infect and establish a long term infection in the swine nervous system. The investigators have identified viral genes that remain active even when the infection is latent. It is hoped that this basic research can be adapted to a rapid field test to diagnose latent disease and remove carrier swine from the population. These results are of immense importance to the swine industry since acute pseudorabies may cause abortion in pregnant sows, 100 percent mortality in piglets less than two weeks old, and significant weight loss in adult swine resulting in economic losses that approach one billion dollars annually.

Mr. **Akaka** [assuming chair]. Thank you very much, Mrs. Smith.

Dr. Jordan and Mr. Secretary, thank you very much for being here.

I want to say that I'm glad, as I look around the room, I notice a person from Hawaii. Dr. Chauncey Ching is here, and I want to mention his name and want to say that Chauncey was so active in addressing our fruit fly problem, and when I think of him, I think of him as being responsible for most of the success stories in Hawaii and Hawaiian agriculture today.

So welcome, Chauncey.

Mrs. SMITH. I'm mighty glad you're here, too.

Dr. JORDAN. He's one of our premiere directors, sir.

PACIFIC BASIN

Mr. AKAKA. Well, we're proud of him.

Dr. Jordan, over the past decades, relationships between the United States and the Nations of the Pacific Rim have undergone a dramatic transformation.

Where once the U.S. looked East to Europe for its principle trading allies, it is now increasingly turning to the West, toward Hawaii, too.

Over the past decade, the Pacific Basin has emerged as a world leader in economic growth and trade and a prime region for the development of new markets for U.S. agricultural exports.

USDA has had little problem recognizing this trend. In its 1988 report on agricultural trade in the Pacific Rim, the Department concluded that the explosive growth in the agricultural trade has created a new center of gravity for the world economy.

The Foreign Agricultural Service has forecasted a 7.6-percent increase in U.S. exports of agricultural products to Asia, whereas no growth is anticipated in exports to Europe.

Dr. Jordan, do you agree with this assessment about the extent to which American agriculture is looking to the Pacific Rim for new markets, and would you comment on the role that Hawaii can have when it comes to capitalizing on new market opportunities in Asia?

Dr. JORDAN. Mr. Akaka, we do agree that the data are quite clear in that regard. The opportunities in the Far East and the Pacific Rim, in general, are tremendous.

We in the Cooperative State Research Service look to Hawaii, and specifically the University of Hawaii, to be the principle catalyst for the genesis of new knowledge in the development of human expertise to meet the needs of that region of the world.

In your packet, Mr. Akaka, is a report on the tropical and subtropical agricultural research. It comes out of the College of Tropical Agriculture and Human Resources at the University of Hawaii in cooperation with the College of Agriculture and Life Sciences at the University of Guam, and it focuses on the total basin.

Now, it's not an easily read document. It's written in scientific language, but I put it in your packet simply to emphasize how extensive the need is and how pervasive are the potential values derived from that research. The range of research that's being accomplished includes very, very heavy emphasis on plant disease and pest management, natural resource management, livestock management, and some very fundamental research in the physiology and molecular biology fields. They are extensively covered in that report.

I think it's just the tip of the iceberg of where we're going. As you well know, Mr. Akaka, the University of Hawaii is the centerpiece for that part of the Tropical and Subtropical Agriculture Program, as well.

Mr. **Akaka**. To what extent do you believe that Hawaii, because of its mid-Pacific location, can serve as a catalyst when it comes to promoting greater trade with Asia?

Dr. **Jordan**. I think you can do it for several reasons, Mr. Akaka. One is that it's appropriately placed to understand the physical and cultural environment, that's needed. You must understand both if you're going to focus on what it is that consumers of American products in other parts of the Far East and in the Pacific Rim want. Then maybe we can turn to them for areas of real productivity and increase our international trade.

CENTER FOR TROPICAL AND SUBTROPICAL AGRICULTURE

Mr. **Akaka**. Yes. I happened to see on TV last night a report on California and the fruit fly menace that's there, and it only points out that the Department of Agriculture and you folks are doing a tremendous job in trying to fight the fruit fly menace in Hawaii and, of course, in California.

When I think of the 250 products that Hawaii can grow and produce but at the present time is not able to export, it's a shame. I hope that we can move on eradicating the fruit fly and maybe become a great part of this kind of trade in Asia.

Dr. Jordan, for years the mainstay of Hawaiian agriculture has been sugar cane and pineapple. Both these crops have declined dramatically in recent years, idling acreage and workers.

If rural Hawaii is to continue to grow and prosper, it is essential that Hawaii aggressively pursue agriculture diversification.

Fortunately, Hawaii's varied growing conditions offer an exceptional opportunity for the development of new crops. Of the many different soil and climatic conditions around the world, 80 percent of these can be found or replicated in Hawaii.

What we need is a research center that will open the door to the expansion of tropical and subtropical agriculture in Hawaii.

This subcommittee has shown strong support for the Center for Tropical and Subtropical Agriculture at the University of Hawaii.

In fiscal year 1989, planning funds were appropriated for this facility, and in fiscal year 1990, funds were appropriated to plan and design the proposed center.

I know that you have performed a site evaluation and a capability analysis for that proposed center. From your evaluation, Dr. Jordan, of the situation in Hawaii, what have you concluded about the benefits that such a research center would generate, and does there appear to be strong commitment within the State of Hawaii and its agricultural community about ensuring that the proposed center is a success?

Dr. **Jordan**. Mr. Akaka, Dr. Paul O'Connell is in the audience. He conducted that visit on behalf of the agency, and his report is rather extensive in that regard. First of all, as you point out, the number of alternative crops that can be addressed through that process is substantial in number.

The economic value of those crops, and I'm including floriculture and other things when I say crops, is substantial.

More than that, the commitment by the people of Hawaii, both industry and Government, is the kind of mutual support that we like to see in the building of facilities and programs such as this.

So on the basis of that, Mr. Akaka, I'd have to say that it ranks among the top priorities as we would view them for completion of programs and projects.

TROPICAL AND SUBTROPICAL AGRICULTURE

Mr. **Akaka**. For many years, Dr. Jordan, this subcommittee has supported a program of research on tropical and subtropical agriculture, and I'm pleased to see that the report on this research is among those which you have shared with us today.

My question is what are some of the benefits of performing research in the field of tropical and subtropical agriculture, are you satisfied with the quality of work being performed under this special research grant?

Dr. **Jordan**. The benefits, Mr. Akaka, are that the Nation, as a whole, is the beneficiary of that research. I remember so very well a decade and a half ago, while I was serving as Director of the Colorado Agricultural Experiment Station, when the program was initially in the planning stages.

I was one of the Directors in the United States that prepared supporting letters for it, and the reason was not that we grow much tropical and subtropical agricultural crops in the State of Colorado, but that the Coloradans needed those products and, in fact, demanded those.

So we were in strong support of a program that would meet the needs of the consumers in that State. I think that same story would be supported across this Nation. The quality of the research as we have watched it develop is excellent, and I would add one other thing, Mr. Akaka. The involvement of the Territories, both in terms of the Caribbean Basin and in terms of the Pacific Basin, has been substantial, and without that program, I'm not sure that their capacity to do research would have been nearly as well developed as we see it today.

We particularly see that in both Puerto Rico and the Virgin Islands, and you can certainly see it in Guam.

CENTER FOR TROPICAL AND SUBTROPICAL AGRICULTURE

Mr. **Akaka**. During FY 1989, a team from CSRS participated in a site visit to evaluate the proposed Center for Tropical and Subtropical Agriculture. Based upon this visit, what is your evaluation of the importance of Hawaii achieving great agricultural diversification?

Dr. **Jordan**. Hawaii's year-round growing conditions provide a natural laboratory to investigate agricultural diversification. These investigations will benefit not only Hawaii but also have implications for other parts of the United States seeking to diversify and ultimately be more competitive in world markets. Further, given the private sector and University of Hawaii interests in expanding diversified agriculture, I fully recognize the importance of diversification in Hawaii.

Mr. **Akaka**. To what extent would improved research facilities assist Hawaiian agriculture to achieve greater agricultural diversification?

Dr. **Jordan**. A CSRS team visited Hawaii and prepared a report on the Center for Tropical and Subtropical Agriculture. In the report they concluded that improved research facilities are an essential part of the mission to expand diversified agriculture in Hawaii. The proposed Center will house programs very important to expansion of diversification: pest management, marketing, food processing, and livestock production.

Mr. **Akaka**. Summarize the programmatic approach that the Center for Tropical and Subtropical Agriculture will employ in an effort to serve as a catalyst for agricultural diversification.

Dr. **Jordan**. The basic programmatic approach is to have a close link between the University, state government, and the private sector to facilitate expansion of diversified agriculture. These close working relationships will ensure research relevant to the mission of an expanded diversified agriculture. For example, crop breeding programs will be driven by market criteria.

Mr. **Akaka**. To what extent do other agricultural producing areas look to the University of Hawaii for scientific leadership in tropical and subtropical agriculture?

Dr. **Jordan**. Territories in the American Pacific look to the University of Hawaii for agricultural scientific leadership.

Mr. **Akaka**. Are you satisfied with the willingness of the University and the State of Hawaii to adequately support such a research center?

Dr. **Jordan**. The University of Hawaii, both College and Central Administration, have been strong supporters of the proposed research center.

Mr. **Akaka**. What is the status of this project?

Dr. **Jordan**. My office has been in contact with the University of Hawaii and we are in the process of completing the application process for the planning and design grant appropriated by Congress for fiscal year 1990. The state of Hawaii has also provided a comparable amount for planning and design. Architects have been hired and the planning and design phase is underway.

MINOR CROP PEST CONTROL

Mr. **Alaska**. Dr. Jordan, identify the problems that farmers in Hawaii face due to the cancellation or unavailability of registered pesticides.

Dr. **Jordan**. Hawaii faces unique pest control problems because their year-round growing conditions are also conducive to pest populations. Although some pests have been successfully controlled without the use of chemicals, pesticides are still the only effective means of control for some pests. In addition, because of the high cost of land and other resources in Hawaii, growers may have difficulty competing with mainland sources of food and feed. At present, pesticides provide that slight economic margin that keeps many growers in business.

Pesticide use on each crop must be approved by EPA. Among other things, approval requires the establishment of a tolerance, a time-consuming and costly process. USDA's IR-4 program provides funds to support research needed to establish tolerances on minor crops. This is especially critical to a state like Hawaii where all of the crops are minor crops and thus of marginal economic interest to pesticide manufacturers.

Without a tolerance, there can be no registration. Without a registration, the chemical cannot legally be used on the crop. If no other pest control strategy is available, the grower may not be able to produce a crop. Since many rural communities depend on agriculture, one could expect that serious economic and social disruption could follow the demise of some agriculture industries.

When a pesticide use is canceled, growers dependent on that use must select a more costly and perhaps less effective alternative. If no alternative exists, the University of Hawaii may initiate a research program, often in conjunction with the affected industry and the USDA, to develop one. This occurred most recently with the cancellation of EDB use on papaya. Growers are planning on using vapor heat treatment for disinfestation.

Mr. AKAKA. Dr. Jordan, what are some of the problems that farmers in Hawaii face because of the initial high cost of pesticide registration and the limited market of pesticides for minor crops.

Dr. JORDAN. Hawaii farmers are at a competitive disadvantage with mainland and foreign growers who do not need pesticides to produce a commonly grown crop. Hawaii has many unique pests such as the Mediterranean fruit fly that are uncommon on the mainland or in other countries producing the same crop. Furthermore, from the perspective of pesticide manufacturers, the potential sales for the special needs in Hawaii do not involve sufficient incentive for them to register the needed control measures.

Mr. AKAKA. Dr. Jordan, how will the CSRS special grant on minor crop pest control address these problems?

Dr. JORDAN. The CSRS special grant on Minor Crop Pest Control for Hawaii will be used to address the need to register alternative pesticides for those that were canceled by EPA or for those that pesticide manufacturers chose not to reregister. Some of the grant will be used to develop non-chemical—e.g., biological—pest control strategies.

In addition, the CSRS special grant on pesticide clearance, which is known as IR-4 will significantly address current pesticide uses that chemical companies have told EPA they will not reregister. IR-4 has indicated that with adequate funding, they can maintain about 1000 important pesticide registrations for minor crops. The IR-4 program will work with the University of Hawaii to support the highest priority registrations needed by growers in Hawaii.

Mr. AKAKA. Dr. Jordan, what amounts were provided for this activity in FY 1990 and what amounts are contained in your fiscal year 1991 budget to continue this project?

Dr. JORDAN. In FY 1990, $281,000 is available for this project and no funding is requested in FY 1991. We are, however, requesting a $1 million increase in the National Pesticide Clearance special grant program which could help to address minor use needs for Hawaii.

FLORICULTURE

Mr. AKAKA. Dr. Jordan, identify the multitude of floral crops grown in Hawaii and the various pest, production and postharvest problems faced by Hawaii's floral industry.

Dr. JORDAN. The Hawaiian multimillion dollar floral crop industry includes anthurium, orchids, flowering ginger, bird of paradise, helicona, protea, cut foliage and other floral crops. This industry is faced with cultural, disease, insect pest, and postharvest problems, due to the fact that it is a relatively new industry and has undergone a period of rapid expansion. Serious insect pests include various species of armored and soft scales, mealy bugs, whiteflies, ants, caterpillars, insect eggs, leafhoppers, snails, and flies. The most serious disease is bacterial blight on anthuriums and other aroids which causes propagating materials of these species to be banned from being imported into certain countries.

Mr. AKAKA. What work has been carried on to date and what remains to be accomplished under the floriculture special research grant?

Dr. JORDAN. Research has focused primarily on diseases and insect pests that hinder the marketing of flower crops. Postharvest research will continue to ensure that floricultural shipments will not be rejected for export due to pest contamination.

Mr. AKAKA. Dr. Jordan, what amounts were provided for this activity in FY 1990 and what amounts are contained in your FY 1991 budget for this project?

Dr. JORDAN. In FY 1990, $296,000 is available for this project. No funding is requested for FY 1991.

MULTICROPPING STRATEGIES FOR AQUACULTURE

Mr. AKAKA. What is the status of the multi-cropping strategies for aquaculture special research grant? What work has been accomplished to date and what work remains to be accomplished?

Dr. JORDAN. Present research efforts are aimed at refining the design criteria for the multi-cropping production systems. Prototype systems have been evaluated. Oyster handling and production strategies have also been evaluated. The remaining research will address improved and innovative production systems including the evaluation of fluidized beds for oyster culture.

Mr. AKAKA. What are the advantages and economics that could result from multi-cropping in aquaculture?

Dr. JORDAN. The possible economic benefit of developing multi-cropping strategies in aquaculture would be the harvest of a secondary crop that would result in improved production efficiency for commercial aquaculture systems. Additionally, if the secondary crop is a filter feeder, such as the oyster, multi-cropping strategies could result in improved water quality in both the production system and the effluent discharges from the system.

MARINE TROPICAL FISH INDUSTRY

Mr. AKAKA. Dr. Jordan, identify the annual U.S. market for tropical marine fish for aquarium purposes, and of this market identify the annual U.S. trade deficit for tropical marine fish.

Dr. JORDAN. The Department of Agriculture does not separate marine and freshwater tropical aquarium fish for the purpose of reporting statistical information on the industry. U.S. production is valued at over $25 million. The U.S. imports approximately $38 million worth of ornamental fish and exports approximately $9 million worth of ornamental fish.

Mr. AKAKA. Dr. Jordan, identify the technical problems that must be overcome in order to establish an aquaculture program for the production of tropical marine fish for aquarium purposes.

Dr. JORDAN. The primary technical constraint for many of the species utilized in the aquarium industry is the ability to reproduce these species under controlled conditions. Additionally, larval rearing systems are poorly understood.

Mr. AKAKA. Does USDA presently have a research program in this field? If so, identify the funds that would be expended in fiscal year 1991 in this area.

Dr. JORDAN. The USDA does not have a research program that specifically addresses this field. State experiment stations could utilize formula funds to address this area of research.

REGIONAL AQUACULTURE CENTERS

Mr. AKAKA. Identify the research agenda and recent accomplishments of the Hawaii Center for Tropical and Subtropical Research.

Dr. JORDAN. The Tropical and Subtropical Regional Aquaculture Center has focused on a number of research issues including aquacultural effluents, therapeutic compounds, seed production, marketing and economics. Additionally a number of extension educational projects have been developed.

Research has led to better understanding of the effluents from aquacultural operations as well as measures to reduce the impact of such effluents on the environment. The identification and testing of likely therapeutic compounds for aquaculture in the region has been initiated. Procedures have been developed to improve the production of seed for freshwater prawns. The center has developed an information network, a demonstration program, and resource manuals. Also, curriculum resource materials for secondary schools in aquaculture have been developed.

Mr. AKAKA. What areas of research will this aquaculture center focus on in FY 1990?

Dr. JORDAN. The center has requested a continuation of four research projects initiated in previous years including aquacultural effluents, therapeutic compounds, seed production, and marketing. The development of an information network and an aquaculture demonstration program will also be continued under the extension component of the program.

Mr. AKAKA. What is the current budget for this program and what funds are proposed for the FY 1991 budget?

Dr. JORDAN. In FY 1990, $3,703,000 is available for the aquaculture centers program of which $740,600 is available to the Hawaii Center. No funding is requested in FY 1991.

GULF COAST SHRIMP CONSORTIUM

Mr. AKAKA. What are the major objectives of the Gulf Coast Shrimp Consortium for FY 1989 and FY 1990?

Dr. JORDAN. The major research objectives of the Gulf Coast Shrimp Consortium for FY 1989 and FY 1990 are to improve production systems in order to produce high quality seed, reduce losses from diseases and to develop economically viable production systems.

Mr. AKAKA. What work remains to be done in order to permit successful large scale shrimp farming to become established?

Dr. JORDAN. In order to permit successful large scale shrimp farming in the United States research must focus on shrimp seed production, improved methods to reduce losses as a result of diseases, and improving profitability through the intensification of shrimp production systems. Additionally, in view of changing global market conditions for marine shrimp, research must address production and marketing strategies that will allow US producers to compete with foreign imports.

Mr. AKAKA. What universities and institutions have participated in this research in FY 1989 and FY 1990?

Dr. JORDAN. Grants have been awarded to the Oceanic Institute in Hawaii and the Gulf Coast Research Laboratory in Mississippi. In addition, research is conducted through subcontracts at the University of Southern Mississippi, Tufts University, The Waddell Mariculture Center in South Carolina, the Texas Agricultural Experiment Station, and the University of Arizona.

Mr. AKAKA. What funds are available to carry out this program in FY 1990, and what funds are proposed in the FY 1991 budget?

Dr. JORDAN. In fiscal year 1990, $3,195,000 was appropriated to support this research and no funding has been requested in fiscal year 1991.

TROPICAL AND SUBTROPICAL RESEARCH

Mr. AKAKA. What are the major research objectives of the tropical and subtropical research to be performed in FY 1990 through the Pacific Basin Advisory Group under the Tropical and Subtropical Agricultural Research Program?

Dr. JORDAN. Tropical and subtropical special research grants will continue to focus on strengthening agriculture in the Pacific Basin, to reduce the need to import agricultural products, and to promote, where possible, the export of agricultural products. Tropical and subtropical special research grants will support research on improving plant and animal production, controlling animal and plant pests, determining the best use of soil and water resources and facilitating the storage and marketing of agricultural products.

Mr. AKAKA. What universities will participate in the FY 1990 special research grant in Tropical and Subtropical Agriculture?

Dr. JORDAN. The Agricultural Experiment Stations at the University of Florida, University of Guam, University of Hawaii, University of Puerto Rico, and University of the Virgin Islands, will be the primary participants in the FY 1990 special research grant in Tropical and Subtropical Agriculture.

Mr. AKAKA. What are the major objectives of future research through the Pacific Basin Advisory Group?

Dr. Jordan. Research would continue to focus on improving the agricultural capabilities and reducing the food dependence of the U.S. tropical areas.

Mr. Akaka. What funds were provided for this special research grant in FY 1990, and what funds are available in FY 1991?

Dr. Jordan. In FY 1990, $3,299,000 is available for this program and no funding is requested in FY 1991.

AGRICULTURE DIVERSIFICATION AND SPECIALTY CROPS

Mr. Akaka. What are the research objectives of the Agriculture Diversification and Specialty Crops special research grant?

Dr. Jordan. The research objective is to identify the steps necessary to develop and/or expand a diversified agricultural industry by working closely with the private sector. Accomplishment of this objective has two main benefits: a particular industry will be developed, taro; and, this development will serve as a model for other diversification efforts.

Mr. Akaka. What work has been carried on to date and what work remains to be accomplished?

Dr. Jordan. Discussion with the production, processing, and marketing components of the taro industry has resulted in a number of specific tasks. Some are best done by University researchers, such as, post harvest handling for specific qualities and extracting gums, for other uses. Others are best done by the private sector—devising and implementing market development strategies. These tasks need to be completed during the coming year and the procedures developed need to be tested on other industries—herbs and spices.

Mr. Akaka. What funds were provided in FY 1990 and what funds are available in FY 1991.

Dr. Jordan. In FY 1990 $154,000 is available for this program and no funding is requested in FY 1991.

NATIONAL RESEARCH INITIATIVE

Mr. Akaka. How will the National Research Initiative meet the needs of farmers and ranchers who seek practical answers to problems of marketing, environmental quality, high production costs, and nutritional quality of food products?

Dr. Jordan. The National Research Initiative is designed to not only address basic fundamental research which will supply the knowledge foundation required to address every day agricultural problems with new tools to obtain real solutions but will also have direct approaches to tie into everyday problems. Twenty percent of the National Research Initiative funding will be devoted to mission linked research. This will assist in taking the discoveries of how cells work or how a process works and applying this knowledge to the needs of farmers and ranchers and reducing production costs. There is a major research area proposed in the National Research Initiative for natural resources and environment research which would be funded at $15 million. As the Initiative grows there will be research directed towards market, trade and policy issues. In the first year of the Initiative $5 million is proposed for nutrition and food quality.

Mr. **Akaka**. To what extent will the National Research Initiative compete for the same budget dollar and the Special Grants Program?

Dr. **Jordan**. The increase of approximately $50 million for the National Research Initiative, is accompanied by the largest ever request for Special Research Grants. The Department has recommended funding of $25 million in the Special Research Grants in FY 1991. This is up from zero funding requested in FY 1988. In addition the animal health research in Special Grants is incorporated into the National Research Initiative.

Mr. **Akaka**. I am concerned that putting a majority of funds into the competitive grants program will only give greater advantage to those institutions that already have a large share of the competitive funds. What is to prevent emerging institutions in the Pacific from receiving limited funds from competitive grants while larger institutions that have traditionally received competitive funds only increase their share?

Dr. **Jordan**. The Initiative has proposed funding at ten percent to be awarded to strengthen the institutions who traditionally have been less competitive for grants. Although plans have not been finalized some of the techniques proposed include three year "seed grants" to scientific investigators who have not received a competitive grant for the past five years to enable the new investigator to accumulate data to use in a later application for a competitive grant. This is similar to the National Science Foundation Experimental Programs to Stimulate Competitive Research program; allow successful grant recipients at research universities to expand their program to bring in a faculty member from one of the institutions building their research capabilities, as well as minority faculty; and support post-doctoral and graduate students from these institutions to attend other research universities to gain experience to strengthen their institutions.

GLOBAL CHANGE

Mr. **Akaka**. The FY 1991 budget for CSRS provides an increase of $5,000,000 for research on global change. Provide a breakdown of the amounts to be expended in the areas of methane production, combustion of fossil fuels, UV-B radiation, acid precipitation, and any other areas of research within this special research grant. Indicate the location where this research is to be carried out and the amount to be expended, by location, and the manner for distribution or award of these funds.

Dr. **Jordan**. Research topics that may be addressed include methane sources, alcohol and vegetable oil fuels to replace fossil fuels, improvement of external combustion engine technology, UV-B observations to determine what energy levels are reaching U.S. agricultural and forest areas, and analysis of ties between acid precipitation and global change particularly climate change. Since new information is developing rapidly in global change research, final topic areas will be determined through continued planning with researchers and administrators in each of the research areas. These funds will be awarded competitively. Therefore, the location of the research projects cannot be determined until the completion of the merit evalution.

INTEGRATED PEST MANAGEMENT

Mr. AKAKA. The FY 1991 budget for CSRS provides an increase of $1,097,000 for research on integrated pest management. Provide a breakdown of the amounts to be expended on the various areas of research within this special research grant. Indicate the location where this research is to be carried out and the amount to be expended, by location, and the manner for distribution or award of these funds.

Dr. JORDAN. The program is managed by each of the four State Argicultural Experiment Station regions to address research priorities identified in each region. Priority IPM research is currently addressed in the following commodities: North Central region—potatoes, corn, livestock, soybeans, and swine: North Eastern region—potatoes, apples, structural pests, and forage; Southern region—livestock/swine, soybeans, cotton, pecans, and forage; Western region—potatoes, alfalfa, small grains, rangelands, and tree fruits. The priorities within the commodities relate to biological control, cultural control, host plant resistance, movement and dispersal of biotic agents, pesticide resistant management, interactions between pest and host and control measures. Each region is continually modifying and updating their research priorities. Emphasis is being placed on preventive pest management and biology intensive management to interface with sustainable agriculture and environmental issues. Grants are awarded on a competitive basis judged by peer panel science evaluations in the regional priorities and to date 46 states have received grant support.

PESTICIDE CLEARANCE

Mr. AKAKA. The FY 1991 budget for CSRS provides an increase of $1,025,000 for research on pesticide clearance. Provide a breakdown of the amounts to be expended on the various areas of research within this special research grant. Indicate the location where this research is to be carried out and the amount to be expanded, by location, and the manner for distribution or award of these funds.

Dr. JORDAN. New regulatory requirements of EPA for implementation of "Good Laboratory Practices" and recent amendments to the Federal Insecticide, Fungicide, and Rodenticide Act—FIFRA—passed by the 100th Congress are two major areas that need immediate action under the Pesticide Clearance—IR-4—program. If American agriculture is to have available the legally registered materials necessary to provide for a wholesome and nutritious diet for the consuming public and to supply them with the ornamental plants to beautify their environment, it is essential to meet these regulatory demands. Good Laboratory Practices will increase the work load, conservatively estimated, by about 25 percent and is being required for both field and laboratory research.

Recent FIFRA amendments greatly accelerate the need for reregistration of currently used pesticides including many used on minor crops. Reregistration of previously registered pesticides will require redoing much of the original research using current state of the art technology. The continued registration of all the fungicides and a number of herbicides is currently under review. There is no patent protection and very little economic incentive for commercial companies to reregister these older pesticides. In contrast, the economics to the user are excellent, and further, these older pesticides have been researched and incorporated into sound environmental management systems. Their loss would be a severe restriction to pest management programs.

If funded, the increase will result in a total special research grant of $3 million. In the past, funds have been split equally between each of the four leader laboratories and headquarters. The four leader laboratories are located at the University of California at Davis, Michigan State University, University of Florida, and Cornell University at Geneva. Headquarters is at Rutgers University.

Each leader laboratory determines projects with concurrence of each State Agricultural Experiment Station liaison representative. Funds are allocated to researchers for specific projects by the leader laboratories.

Mr. **Akaka**. I thank you very much for your responses, Dr. Jordan. Thank you.

Mr. Watkins?

VALUE ADDED RESEARCH

Mr. **Watkins**. Thank you, Mr. Chairman.

Welcome, and I'm glad to see you back this year, and I've got two or three questions. You know, I've been a supporter of research for a long time, and I think we have to do it in production, but one of the areas that I've tried to place some emphasis on since I've been here has been on some of the value added side of it and along the preservation processing.

In Oklahoma, we have a lot of commodities and raw products, et cetera, that we end up exporting. Many of our commodities we export, instead of doing the things necessary to do the value added, and I notice this seems to be the trend in this great country.

Instead of us trying to build from the natural resources or our raw commodities, we ignore doing as much in the value added area.

I want to inquire about the status of the research in Oklahoma, beginning with South Central Research Center there. Are we making some headway in that area?

Dr. **Jordan**. I don't think there's any question, particularly in terms of food products, Mr. Watkins. There is cooperation between the College of Home Economics, the College of Agriculture and the ARS Program. They are meeting very well in terms of the products produced.

Mr. **Watkins**. Let me ask the question also related to that. The fact that again we have many trade imbalances in this country with other countries, and we're going to be in a much more competitive situation in the years ahead, are we doing research in the value added areas and the processing areas that will allow us to export more value added products?

Do we have research in those areas? By that, I mean the nutritional type research, making sure we are preparing commodities in a way that will be consumed by other countries that we have the opportunity to sell to, and I'm also thinking now like all the wide open opportunities with Eastern Bloc countries.

We know in the Pacific Rim area and the Asian area, but lots of times we've said here's our raw commodity, and we haven't done the research and all the preparations in order to reach those markets abroad.

Dr. **Jordon**. Many of the State Agricultural Experiment Stations now routinely not only have economists working on a cooperative project, but also have food technologists and nutritionists working on the projects. Before a particular commodity is released to the consuming public, research is done that covers the nutritional value aspect of it.

Let me cite a single example. A potato was released about a decade ago that went through some additional testing to ensure high nutritional quality and to see what happened to it as you cooked it in various ways?

What were the energy costs associated with that new variety of potato? That was terribly important. There is work going on in both ARS and through the university-based system, Mr. Watkins.

Mr. **Watkins**. Well, I've been inquiring with my alma mater, Oklahoma State, and also with the South Central Research Station there, of wanting to do more nutritional research in order to meet the tastebuds of our international friends and countries.

That's what I was trying to allude to there or trying to get to. I mean, are we doing anything in the research area that would allow us to ship that product in more of a value added product instead of just a raw commodity?

Dr. **Jordon**. I think your point is well taken. We are not doing as much in terms of the palate of the foreign market. They are usually doing the work in terms of the palate of the American.

Mr. **Watkins**. I'm quite sure you'll be hearing from some of our people, because we've had some round table discussions on that, and I've been kind of trying to encourage them to do that, and they've indicated they needed to have some kind of dollars to work with that type of operation.

Dr. **Jordon**. We do, Mr. Watkins, have a couple of examples where at international trade development centers they are focusing on what is desired at the international trade level but it's not enough.

NATIONAL EQUINE—BOVINE TECHNOLOGY CENTER

Mr. **Watkins**. We've got some serious problems there, and I think if we're going to get in the arena prepared to compete, we're going to have to do some of that.

I've asked Oklahoma State University to lead out on some of that type of research, and they're working with some of the others, and I just wondered if you had in other areas.

Let me ask you about the National Equine-Bovine Technology Research Center that's being planned. We have probably a larger number of quarter horses in Oklahoma than in any State in the Nation.

In fact, I guess I have to say my home county where I live has produced more champions than any other county in the Nation.

But there is a tremendous need for some equine research in this particular industry, the equine industry. How are we coming along? Do you know if the planning is coming along on that?

Dr. JORDON. The status of that project——

Mr. WATKINS. Please provide it for the record. You can provide it for the record or the $3 million or $4 million that's needed to build it, whichever one.

Dr. JORDON. Mr. Watkins, the proposal has been requested, and we're expecting it by about the first of May.

[The information follows:]

NATIONAL EQUINE-BOVINE TECHNOLOGY RESEARCH CENTER

It is our understanding that building specifications for the facility are complete and the architect is currently working on the schematic drawings. University officials are looking forward to completion of the schematics by mid-Spring, with ground-breaking tentatively scheduled for late Winter 1991. Assuming favorable weather conditions, construction could be finished by Christmas 1991 and occupancy could occur as early as February 1992.

Mr. WATKINS. Okay. Let me mention, this is outside my area, but I was up in Congressman Glen English's area, and there's some expanded wheat pasture research, beef grazing of wheat pasture, and I did some work on that trying to prepare a talk up there with the people, and I found that in over half the wheat pasture in Oklahoma is not being grazed, and we've got a lot of stockyard cattle units that are going outside the State, and it looked like the potential, if we could utilize that more, would be nearly a ten percent jump in the agriculture economy of Oklahoma.

So I just want to mention to you that I hope you'll not take it lightly and try to make sure there's some revenue there in that area, because it has a great importance.

INTEGRATED PRODUCTION SYSTEMS SPECIAL GRANT

Mr. WATKINS. What is the status of the integrated production systems special grant received by Oklahoma State University?

Dr. JORDAN. Research is being conducted to determine fruit and vegetable crop cultivars which are best suited to growing conditions in southeastern Oklahoma, to develop cultural production techniques which will support a viable fruit and vegetable industry in southeastern Oklahoma, and to identify pests and develop effective and economical disease and insect control strategies for crops in southeastern Oklahoma.

Mr. WATKINS. What does the capability statement from Oklahoma State University reflect for continued use and need of such funds?

Dr. JORDAN. The initial proposal anticipated this project would be completed within a five-year period.

PRESERVATION AND PROCESSING SPECIAL GRANT

Mr. WATKINS. What is the status of the preservation and processing research being conducted by Oklahoma State University?

Dr. **Jordan**. Research is being conducted on the effect of various postharvest horticultural practices on the biological and physical condition of processed fruits and vegetables, and the development of new and improved harvesting, handling, and storage techniques, from harvest to marketing of the final product. Many of the factors responsible for product deterioration, including loss of water, photosynthate, minerals, type of packaging, and storage conditions have been identified.

Mr. **Watkins**. What does the capability statement from Oklahoma State University reflect for continued use and need of such funds.

BRUCELLOSIS RESEARCH

Dr. **Jordan**. The initial proposal anticipated this project would be completed within a five-year period.

Mr. **Watkins**. What research and where is research being conducted on brucellosis?

Dr. **Jordan**. Research on diagnostic methods for brucellosis are being conducted at Iowa State University, Oklahoma State University, Texas A&M University, and the University of Wisconsin.

Studies involving the immune system and vaccines in relation to brucellosis are conducted at Auburn University, Cornell University, North Dakota State University, Oklahoma State University, Scripps Clinic of California, Texas A&M University, University of California-Davis, University of Florida and University of Wisconsin. Studies of the disease processes, pathogenesis, and the pattern of disease spread are being conducted by all of the above universities, with the exception of Cornell University, as well as Louisiana State University and Mississippi State University.

Mr. **Watkins**. How much money is currently dedicated to brucellosis research in the CSRS system?

Dr. **Jordan**. Approximately $820,000 of CSRS funds is being spent on brucellosis research. In addition, the colleges and universities are using approximately $3.2 million of non-federal funds for research on brucellosis.

Mr. **Watkins**. When can we expect results from the research?

Dr. **Jordan**. Research on brucellosis has yielded results over the past ten years which have been adopted in the brucellosis eradication program. These results include adult vaccination with reduced vaccine doses, improved diagnostic methods and better understanding of the epidemiology and immunology of brucellosis. We expect continuing improvement in our ability to diagnose the disease. Applied epidemiology research on new vaccines is promising, however, products from this research will require further study. The timetable for availability of such products depends not only on progress in vaccine research and development, but also on accompanying progress in the eradication program and stipulated requirements for new brucellosis vaccines in terms of efficiency, convenience of use and cost.

NATIONAL EQUINE AND BOVINE BIOTECHNOLOGY RESEARCH CENTER

Mr. **Watkins**. What is the status of planning for the Center to be constructed at Oklahoma State University?

Dr. **Jordan**. It is our understanding that specifications for the facility have been completed and the architect is now working on schematic drawings. University officials anticipate that the schematics will be done by mid-Spring.

Mr. **Watkins**. What is the planned cost of the facility? What would be the State's share for the facility?

Dr. **Jordan**. The total cost of the facility is estimated at $9.5 to $10 million. We understand that the university plans to request between $3 and $3.5 million in Federal support, with remaining costs to be borne from State and private sources.

Mr. **Watkins**. Will OSU be in a position to move forward with construction in Fiscal Year 1991 provided there are funds available?

Dr. **Jordan**. If funds are available, the university plans to break ground in late Winter 1991 and to have construction completed within six to eight months of groundbreaking. Barring hazardous weather or other unforeseen conditions, occupancy of the facility could be as early as February 1992.

EXPANDED WHEAT PASTURES RESEARCH

Mr. **Watkins**. What is the status of the research being conducted on the expanded use of wheat pasture?

Dr. **Jordan**. The research on expanded use of wheat pasture was initiated under a Special Research Grant in fiscal year 1989. A 500+ acre pasture research unit has been developed with both agronomic and grazing studies initiated. Energy supplementation studies showed weight gain increases of 0.5 pounds per day during the fall grazing period and projected profit could be as much as $18 per head. Bloat incidence was also reduced.

Mr. **Watkins**. What are the Oklahoma State University projected economic benefits on the State's economy as a result of this research?

Dr. **Jordan**. Oklahoma State University Agricultural economists have projected a potential annual state income increase of $308 million from the expanded use of wheat pasture.

Mr. **Watkins**. What is the projected time frame for completion of this research?

Dr. **Jordan**. Scientists at Oklahoma State University, in their initial proposal, projected five years for the completion of this research project.

CENTER FOR INTERNATIONAL TRADE DEVELOPEMNT

Mr. **Watkins**. It is my understanding that the CSRS program funds have been expended and that significant data and impact has been achieved as a result of the direct research with industry. Could you comment on this research and the work by OSU on this project?

Dr. **Jordan**. The Center has a two-fold mission. One is to expand the international marketing of agricultural commodities and products by regional firms through a program of research and outreach. The second is to expand the University's human resource development and technological leadership for international trade development through innovative changes in the academic program.

The research program consists of several components designed to carry out the first mission. They include studies to identify international markets for the four-state region's commodities and value added products, export capacity of various industries, quality improvement research to enhance product competitiveness, and analytical support tailored to encourage and assist firms in opening new export markets. The market oriented research program combined with an outreach program has increased industry and firm awareness of export market opportunities and provided the research information firms need to develop successful marketing strategies.

Mr. **Watkins**. Does OSU indicate a capability to do further research work in the trade area provided there are funds available in Fiscal Year 1991?

Dr. **Jordan**. The University is developing the physical plant and human resources to carry out a more extensive and comprehensive international marketing research program for agricultural and related commodities and value-added products.

Mr. **Watkins**. Have there been discussions on specific trade research proposals? If so, what do they entail?

Dr. **Jordan**. We have had some preliminary discussions with several of the Center's staff regarding plans for the research program. Given the expectations of having the building available soon, appointment of a new Director for the Center, and growing interest on the part of faculty and industry, the next appropriate step would be to deveop a strategic plan to best utilize the available resources to accomplish the Center's mission. This plan would identify key research issues and the procedures for their resolution. Development of such a plan should involve faculty, industry, and public officials interested in export market development.

PECAN APHID/WEEVIL RESEARCH

Mr. **Watkins**. Has there been special grants research funds targeted at pecan aphid or weevil research in the Southeast United States? Has CSRS dedicated other funds to this research?

Dr. **Jordan**. There have been no grant awards in the Southeast United States for research on pecan aphid or weevil research. Investigators in the State Agricultural Experiment Stations are eligible to submit grant proposals to the Southern Integrated Pest Management Special Grant Program. Hatch Act Regional Research funds, however, have been dedicated to pecan insects including pecan aphid and pecan weevil. Significant accomplishments have been made by investigators participating in Regional Research project S-220, Improved Systems of Control for Pecan Arthropod Pests. Cover crops of annual legumes have been evaluated as insectories for alternate prey of predators of pecan aphids; the impact of aphids on subsequent nut set and retention has been shown to be highly significant; the predator green lacewing has been shown to be the most important predator of pecan aphids, other important predators are the brown lacewing and the spiders; a soil fungus and a biological control nematode agent have demonstrated potential for the management of pecan weevil; early season control of pecan foliar pests with a systemic insecticide protects natural enemies and prevents mid-season outbreaks of secondary pests. Results under this regional research program allow this crop to be grown with less pesticide without loss of yield or quality than it could be grown prior to the initiation of the regional research. This has resulted in a higher quality product at a lower cost to the consumer.

ALFALFA RESEARCH

Mr. **WATKINS**. Please provide for the record any special grants targeted at alfalfa research. How much money from CSRS is being dedicated to alfalfa research?

Dr. **JORDAN**. Approximately $2.6 million of CSRS funds are being used for alfalfa research. In addition, the colleges and universities are also using approximately $9.6 million of non-Federal funds to conduct research on alfalfa. Research on alfalfa has been funded through Special Research Grants at approximately $330,000, principally under the Integrated Pest Management Program. Work in the North East Region has focused on modeling the alfalfa plant, as well as interaction of plant nutrients and pest damage and forage quality and utilization. Studies in the Western Region have focused on weed, insect and disease management. One project in the Southern Region conducted by Oklahoma State University is evaluating the effect of harvest schedule on weed and insect problems.

Mr. **WHITTEN**. Mr. Skeen?

NATIONAL RESEARCH INITIATIVE

Mr. **SKEEN**. Is the $100 million for the National Initiative for Research on Agriculture, Food and Environment new money? If not, specifically where do these funds come from and which programs will be effected as a result?

Dr. **JORDAN**. The National Initiative for Research on Agriculture, Food and Environment includes the current Competitive Research Grants program which was funded at $42,521,000 in FY 1990. The animal health formula and special grants programs, which were funded at $11 million in FY 1990, have been incorporated into the animal systems component of the Initiative. Other than these programs the balance is new money and will not affect other programs.

Mr. **WHITTEN**. Mr. Traxler?

COMPETITIVE GRANTS

Mr. **TRAXLER**. I want you to know that I agree with my Chairman regarding his concern for the propriety of the competitive grant program, including the efforts to expand this program to $100 million. No one doubts the quality of the research work. Rather, our questions go to the balance of the research program. Why do you want to increase competitive grant funds rather than increasing either formula grant funds or opportunities for special research grant work?

Dr. **JORDAN**. Both the Department and the Agency would agree that the issue is the question of balance in the research program. Looking at the 1990 Budget for research in the Agricultural Research Service—ARS—and the Cooperative State Research Service—CSRS—$917.5 million has been appropriated, excluding education and facilities programs. Of that, $202.8 million constitutes payments to the States for various programs and accounts for 22.1 percent. Competitive Research Grants and other awards made competitively amount to $48.2 million or 5.2 percent with the remaining $666.5 million constituting directed programs or 72.7 percent of the total. Even if you address only the issue of the CSRS budget, 62.1 percent is in payments to the States, 23.2 percent in directed programs, and 14.7 percent competitively awarded. The Department believes that all three programs are important with each having its own purpose. Payments to the States are related to the maintenance of partnership; directed programs are to assure the Nation that specific pieces of agricultural research are accomplished with heavy emphasis on the utility of the results; competitively awarded programs are designed to attract highly qualified scientific talent from whatever source it can be obtained, and thus, in structure parallels the extramural grants programs of the National Institutes of Health and the National Science Foundation.

The Administration's 1991 proposal recommends $958.4 million for research in ARS and CSRS together, with payments to the States accounting for 20.6 percent, competitively awarded programs at 10.4 percent, leaving 69 percent in directed programs. We believe this to be a move in the right direction in order to bring the competitively awarded part of the program, all of which is in the National Research Initiative, to at least a significant percentage of the total and does not significantly nor negatively impact on the directed program since it will still be about $660 million in size. The National Research Initiative has incorporated into its base critically needed research in animal health and disease plus other areas in animal systems and three other major program areas, including plant systems, natural resources and the environment, and nutrition, food quality and health. This effort at augmenting agricultural research for a strong competitive program has strong support not only from the Administration but also from the scientific community and a significantly large part of the community that represents agricultural commodities. We strongly support the National Research Initiative and its competitive process because it is open to scientists in the Agricultural Research Service and all other Federal laboratories as well as private laboratories and the university system of America. History shows that two-thirds of these grants will go to the university system and the Agricultural Research Service, but it brings a significant contribution to our knowledge base from research organizations not traditionally associated with agricultural research. It has all the attributes of the National Science Foundation program, but in addition, is built on the strong base of a directed program and a partnership program through payments to the States. Funding of the National Research Initiative will prove to be a wise investment in research that will strengthen our fundamental knowledge base that is going to be needed to answer critical questions that impinge on the competitiveness of American agriculture.

Mr. **Traxler**. Please provide a table showing in constant and nominal dollar terms since 1980 the funds available for formula grants.

[The information follows:]

CSRS Formula Programs
($ in Millions)

Fiscal Year	Hatch Act		McIntire-Stennis Cooperative Forestry	
	Appropriation	Constant Dollars	Appropriation	Constant Dollars
1980	$118.6	$118.6	$10.0	$10.0
1981	128.6	117.7	10.8	9.9
1982	141.1	120.6	12.0	10.3
1983	149.3	121.0	12.5	10.2
1984	152.3	119.9	12.7	10.0
1985	156.5	119.2	13.1	10.0
1986	148.8	111.0	12.4	9.3
1987	148.8	107.5	12.4	9.0
1988	155.5	109.2	17.5	12.3
1989	155.5	104.8	17.5	11.8
1990	155.1	100.5	17.3	11.2

Fiscal Year	Evans-Allen, 1890 Institutions		Animal Health & Disease, 1433	
	Appropriation	Constant Dollars	Appropriation	Constant Dollars
1980	$17.8	$17.8	$6.0	$6.0
1961	19.3	17.7	6.5	6.0
1982	21.5	18.4	5.8	5.0
1983	22.4	17.9	5.8	4.8
1984	22.8	18.0	5.8	4.6
1985	23.5	17.9	5.8	4.4
1986	22.3	16.6	5.5	4.1
1987	22.3	16.1	5.5	4.0
1988	23.3	16.4	5.5	3.9
1989	24.3	16.4	5.5	3.7
1990	25.0	16.2	5.4	3.5

COMPETITIVE GRANTS

Mr. **Traxler**. Some researchers have complained to me that the competitive grant program does not provide opportunity for more basic research activities, like working on problems related to bunt, and the development of new varieties. They claim that the competitive grants are for a period of three years, while responsible varietal development projects may take from seven to ten years. How do you respond to these assessments?

Dr. **Jordan**. Limited program funds and legislation which limits awards to a maximum of five years have dictated that we emphasize some of the fundamental questions that might lead up to longer term projects, like varietal development, rather than undertake varietal development directly. For example, studies underway on the plant's response to drought at the biochemical level may provide clues to plant breeders about plant traits to select when developing drought tolerant plants.

Mr. **Traxler**. If you were to provide broad categories of research work, such as disease control, varietal development, post harvest technology, et cetera, what percentage of each of these types have their projects approved, and what percentage are not approved?

Dr. **Jordan**. The plant research supported in the Competitive Research Grants Program addresses all these broad categories mentioned. Although they are not identified by these specific names, the information that will come from the research supported can be expected to be of assistance in reaching solutions to such problems. The overall success rate for the Competitive Research Grants program is about 20 percent of those investigators who apply, with an award of about 10 percent of the funds requested.

Mr. **Traxler**. Could you also again update me on your efforts to provide competitive grants for multidisciplinary research efforts?

Dr. **Jordan**. In 1989, $500,000 was awarded to Michigan State University USDA-DOE-NSF Plant Science Center for Genetics and Biochemical Alteration of Plant Lipid and Starch. The Michigan Center is conducting basic research into lipid and starch metabolism with the goal of genetically manipulating certain crops to produce compounds useful for non-food purposes.

In the National Research Initiative four types of grants will be awarded and two of these involve multidisciplinary research efforts. Fundamental Multidisciplinary Team Grants will support collaborating scientists from two or more disciplines, focusing on basic science or engineering questions. It is often at the juncture of disciplines that new discoveries and research strategies are made. Mission-linked Multidisciplinary Team Grants will support multidisciplinary research focusing on more applied problems of national significance and should be broadly interlinked. Funding through this grant type will facilitate the application of knowledge and the transfer of technology to the user through joint efforts.

GROUNDWATER RESEARCH

Mr. **Traxler**. As I am sure you know, the National Association of State Universities and Land-Grant Colleges have been most supportive if not the initiator of the groundwater efforts found in the USDA budget. They recommend increases in these efforts to $10 million in the special grant program, the same as your budget request. Is the specific range of our planned activity in line with the NASULGC recommendation?

Dr. **Jordan**. Recommendations of the National Association of State Universities and Land Grant Colleges are in line with the Cooperative State Research Service—CSRS—role as described in the U.S. Department of Agriculture's research plan. This plan has two research objectives: a national program which addresses issues associated with regional agricultural production systems and their potential impact on ground water quality; and a targeted program known as the Midwest Initiative which will determine the impact of relatively heavy pesticide and nitrogen use typical of corn belt areas. CSRS has also proposed an increase of $4.6 million for water quality in fiscal year 1991 as part of the National Research Initiative. This would allow CSRS to expand and enhance the national program in water quality. The planned activities in the research program for fiscal year 1991 includes the following specific research areas: reactions of potentially hazardous agricultural chemicals with soils, water, and other chemicals; processes of retention, degradation, and movement of contaminants through soils and substrata to ground water; uptake by plants that could result in both the removal of contaminants from the root zone, or their cycling into products potentially harmful to humans; development of prevention and remedial technologies and systems of management that reduce use or impacts of potentially hazardous chemicals; and evaluation of economic and sociological implications of adoption or non-adoption of new systems.

These recommended increases in funding will build on current programs and strengthen CSRS participation in collaborative interagency research on these regional and national priorities for water quality.

Mr. **Traxler**. Can you update me on your cooperative efforts with other agencies of USDA and with EPA on ground water research?

Dr. **Jordan**. The USDA Research Plan for Water Quality was developed by CSRS, the Agricultural Research Service—ARS—and the State Agricultural Experiment Stations—SAES—in close cooperation with the Extension Service and the Soil Conservation Service. The targeted research program in the Midwest Initiative included joint funding from both CSRS and ARS, and was jointly planned with scientists and administrators from the U.S. Geological Survey—USGS—and the U.S. Environmental Protection Agency—EPA. Scientists from CSRS, ARS, USGS and EPA, plus the State Agricultural Experiment Stations were involved in the review and recommendations of research proposals selected for funding. This program will be implemented in cooperation with these agencies, plus other State and Federal agencies, which will also cooperate in the future planning and evaluation of progress of this research.

Mr. **Traxler**. Can you more fully describe what you hope to do with your Midwest Initiative, including the integration of existing projects like the subirrigation project in Michigan?

Dr. **Jordan**. The Midwest Initiative includes targeted research in the heavy pesticide and nitrogen-use area of the corn belt. The research program in the Midwest Initiative was initiated by funding in FY 1990, and will be continued with approval of funding in FY 1991, with emphasis on ground water quality. In this initiative, scientists of the SAES and ARS in cooperation, as appropriate, with the USGS, EPA, SCS, Extension Service, and other federal and state agencies, will use an integrated approach to agricultural production systems research. These field evaluations of the environmental effectiveness and economic feasibility of different combinations of farming methods that utilize potentially hazardous chemicals will provide sound justification for changes in production practices. Scientists involved in the Midwest Initiative Program will be encouraged to integrate knowledge generated from existing and newly planned research projects that are related to the overall objectives of the Midwest Initiative. Also, to make the most effective integration of newly-planned and funded research related to water quality, guidelines for research proposals from the North Central Region for the 1990 CSRS Water Quality Research Program included, and proposals awarded were selected on the basis of their relationship to and support of, the objectives of the Midwest Initiative. Thus, current and newly-funded water quality research should help strengthen and expand the usefulness of findings from the Midwest Initiative research.

INDIRECT RESEARCH COSTS

Mr. **Traxler**. One of the more controversial provisions of the 1990 appropriation among experiment station personnel was the limitation of indirect research costs in the competitive grant program to 25 percent of the research grant. What have you heard in response to this limitation from either individual universities or from associations like NASULGC?

Dr. **Jordan**. We are aware of concerns by the Association of American Universities and individual universities resulting from the recent limitation placed on indirect cost recovery. We also understand that the National Association of State Universities and Land-Grant Colleges has expressed strong reservations that the indirect cost restriction will mandate cost-sharing the difference between the 25 percent and the audited indirect costs. They feel this would favor the rich states that can subsidize research and discriminate against the states which are less able to cost-share.

Mr. **Traxler**. The Chairman points out that this limitation means that while less is available for indirect costs, more is available for approving actual research proposals. What is your view of this trade-off?

Dr. **Jordan**. The Cooperative State Research Service has not awarded any competitive grants this fiscal year containing the indirect cost restriction and we have not had the opportunity to actually see the savings on indirect costs, if any, to provide more funding for research.

Mr. **Traxler**. How standardized is the definition of "indirect costs" across the research community?

Dr. **Jordan**. As you are aware, the Federal government makes grants to a variety of organizations whose purposes vary greatly in the types of services they provide in their organizational structures, and in their accounting systems and costing practices. To compensate for this diversity, Federal regulations have been issued to provide specialized guidance for the indirect cost area to standardize cost principles according to the type of organization. For example, OMB issued separate cost principles for colleges and universities; state and local governments; and non-profit organizations. GSA issued cost principles for profit-making organizations.

Mr. **Traxler**. What do you believe to be a reasonable range for indirect costs?

Dr. **Jordan**. We recognize that indirect costs are real costs and necessary to grantee operations and that these costs have to be recovered in some way. They can either be provided for in the application of the negotiated indirect cost rate or the unrecovered difference made up by the grantee or from other sources. It is very difficult to determine a reasonable range for indirect costs since the institutional services and costs vary among the individual organizations. These differences are taken into consideration when negotiating indirect costs agreements with each individual organization.

Mr. **Traxler**. Competitive grants allow for indirect costs. Special grants do not. How significant is the indirect cost issue as a reason for preference of competitive grants over special grants?

Dr. **Jordan**. It appears that the preference for competitive grants over special grants involves a great deal more than just indirect costs. The grantee community seems to prefer competitive grants because of the wide variety of organizations that are eligible to compete for the funds and because all of the funding is subject to award through merit based competition. The clientele for special grants and the subject matter is often restricted to those institutions with a demonstrated expertise in agriculture or a specific subdiscipline. On the other hand, one of the missions of a competitive grant program is to encourage those investigators who have not previously so directed their research to agricultural problems to address agricultural issues. Often these individuals are not eligible to compete for special grant funds.

Mr. **Traxler**. To what extent has the indirect cost limitation reduced your applications for competitive grants this year?

Dr. **Jordan**. The number of applications received are running about the same as last year with a small increase in some of the programs.

HIGHER EDUCATION

Mr. **Traxler**. I have raised the issue of support for higher education with you for the past several years. I am hopeful that we are making progress, but I know that we have a very long way to go. How much progress have we made?

Dr. **Jordan**. Today there still are very serious problems with the emerging human capital base on which our nation's future food, agricultural, and natural resource system will depend. Plenty of current evidence—mediocre aptitude scores, stagnant or declining enrollments—indicates that science, in general, is out of style and is a low priority among our nation's young people. And, few students are standing in line for the opportunity to study agriculture and natural resources. Fewer than 700 U.S. citizens, an average of

14 per state, earned Ph.D's in the food, agricultural, and natural resource sciences last year. Also, compensation for careers associated with the food chain has lagged behind other professions.

Perception is reality. Common contemporary perceptions are that food, agricultural, and natural resource higher education programs have narrowly focused technical curricula and are populated with below average students. Recent Scholastic Aptitude Test scores of undergraduate agriculture students were 73 points below the mean of all college undergraduates. Also, Graduate Record Examination scores of graduate students in agricultural disciplines were 56 points below the mean of all graduate students. Food, agricultural, and natural resource higher education curricula are also perceived as low quality and lacking the rigorous challenges and experiences to develop students with higher level critical thinking and analytical skills. Perceptions that minorities are underrepresented are supported by the fact that they accounted for only 5.2 percent of the undergraduates and 9.0 percent of the graduate students enrolled in food, agricultural, and natural resource higher education programs in 1988–89.

While we face serious challenges, we can take heart in the fact that our human capital development problems are not insurmountable. To develop the requisite human capital for the food, agricultural, and natural resource system, we must focus upon three critical challenges—enriching program quality, attracting and retaining scholars, and increasing minority participation. Today, most colleges and universities with programs in the food, agricultural, and natural resource disciplines are aggressively addressing these challenges. Collectively, they are tackling these problems in cooperation with the Higher Education Programs office of the Cooperative State Research Service, U.S. Department of Agriculture. Enrollments are increasing again in some baccalaureate degree programs, and major curricular changes are being debated and adopted on many campuses. Schools are expanding scholarship programs to attract and retain quality students. They are conducting strong career information programs. Significant investments are being made to stimulate increased participation of minorities. Undergraduate research programs and industry internships are being emphasized to augment the educational experience of many students. Also, graduate fellowships are being established to attract excellent students to prepare for scientific careers in the food and agricultural sciences. All of these factors and programs are highly effective stimuli in human capital development.

If the food, agricultural and natural resource system invests sufficiently and appropriately in the human resources marketplace, significant progress can be achieved. Perhaps this point can be best illustrated by the excellent response to the USDA National Needs Graduate Fellowships Program established in 1984. The mean Graduate Record Examination score of the 476 fellows supported to date by the program is 1,300, more than 300 points above the average graduate student in agriculture. These fellows, all U.S. citizens, were and are among the top five percent of doctoral students in American universities. We expect similar results from the Institution Challenge Grants Program initiated in FY 1990. This program will catalyze significant improvements in the quality of food, agricultural, and natural resource higher education programs. It will stimulate curricular change, enhance student experiential learning, recruit highly qualified students, augment faculty development activities, upgrade scientific teaching instrumentation, and improve instruction delivery systems. In addition, the 1890 Institution Capacity Building Grants Program, started in FY 1990, holds great promise for significantly increasing the number of minority graduates. Historically, the 1890 colleges and universities have been the principal contributors of minority graduates to the food, agricultural, and natural resource system. Making additional resources available for these universities to develop faculty, improve curricula, upgrade instructional equipment, foster educational partnerships, and enhance their research capabilities will play a vital role in mainstreaming the development of minority expertise for food and agricultural science and businesses.

Excellent students respond to strong incentives and strong programs. They will embrace the challenges of our food, agricultural, and natural resource system if adequate resources are made available.

Mr. TRAXLER. I keep hearing of vacancies for both ARS scientists and university scientists due to retirements. Suitable replacement candidates are not readily found. Why are we having this problem? Are the candidates not out there? Are they being stolen away by more lucrative opportunities?

Dr. JORDAN. Unfortunately, the U.S. food and agricultural scientific expertise base is seriously eroding and shortages of expertise now permeate the food and agricultural system. This situation began some 10 years ago and has exacerbated since that time so that today there are approximately half as many students pursuing degrees in the food and agricultural sciences as there were in 1980. When this increasing shortage of trained scientists in priority areas of agricultural science and business is coupled with the higher starting salaries offered by the private sector, both government and academia find it increasingly difficult to maintain an adequate scientific and professional workforce.

Mr. TRAXLER. What does this mean for the future of land grant research and ARS?

Dr. JORDAN. With an increasingly eroding food and agricultural scientific expertise base, the government and academic research systems will be faced with positions that cannot be filled and positions that unquestionably will be filled by scientists and professionals with no firsthand knowledge of, or experience relative to, the agricultural system. While the infusion of outstanding non-agricultural scientists into our research labs is highly desirable, it is essential that these individuals with a non-agricultural background have a critical mass of agriculturally experienced scientists with whom to interact and pursue the development of new knowledge.

Mr. TRAXLER. I know that your budget request is for $8.85 million. If you were going to undertake a proper long term effort to deal with our lack of interest in agricultural scientists, how long would you need, and what would be the ideal funding level? This question goes far beyond the issue of your current budget request, and should be answered in a similar far-reaching fashion.

Dr. JORDAN. U.S. agriculture has entered a new era characterized by increasing global dimensions related to competitiveness, food distribution inequities, environmental concerns, and new technologies, as well as policies and regulations that impact various aspects of food and fiber production, processing, and distribution. These changes now characterizing the U.S. food and agricultural system are projected to continue into the next century. They will significantly affect production, processing, marketing, and distribution of food and agricultural products. However, maximizing the rate and quality of such changes will be highly dependent on a continuing supply of scientific and professional expertise. Unfortunately, the food and agricultural scientific expertise base is seriously eroding and shortages of expertise now permeate the food and agricultural system. Furthermore, the infrastructure of the entire U.S. food and agricultural sciences higher education system is plagued with "quality" issues and problems. These include, precipitously declining enrollments at the baccalaureate levels, precariously low graduate enrollments, less than desirable student academic quality, inadequate minority enrollments at all degree levels, and erosion of the quality of the infrastructure undergirding higher education in the food and agricultural sciences. In order to effectively address this situation, a more proactive stance on behalf of scholarship and the development of scientific and professional expertise will be necessary over the next 10 years. The mechanisms needed to change this situation are already in place—the Food and Agricultural Sciences National Needs Graduate Fellowships Grants Program, the Institution Challenge Grants Program, and the 1890 Institution Capacity Building Grants Program. The NASULGC Division of Agriculture, Resident Instruction Committee on Organization and Policy has recommended a significant funding increase for each of these programs which would achieve the results discussed below.

National Needs Graduate Fellowships Grants Program—$15 million per year. Currently the United States is facing a critical shortage annually of 2,300 scientists, engineers, and related specialists and 2,000 managers, financial specialists, and marketing specialists in the food and agricultural sciences. If the Graduate Fellowships Program were funded at $15 million per year, 2,400 graduates could be infused into the food and agricultural sciences system over the next 10 years. This would allow USDA to support 240 doctoral and master's students per year as opposed to the 57 we are currently able to support. With this increase, the Graduate Fellowships Program could be significantly enhanced by bringing the fellowship stipends back to a more competitive status with the other arms of the Federal Government which are investing in areas of critical manpower shortages, such as the National Science Foundation, the National Institutes of Health, and the Department of Defense; expanding the targeted need areas in which students are trained to include such recently identified high priority shortage areas as environmental sciences and resource conservation and management; and targeting at least 10 percent of the fellowship funds for the support of minority graduate students; namely, Blacks, American Indians, Hispanics, and women. In addition, this enhancement of the Fellowships Program would be designed to complement the National Research Intitiative at the doctoral level.

At this time, USDA can support only three years of training for each doctoral student. The National Research Initiative funding could be used to provide additional years of support to ensure the student's completion of the doctoral degree or to move the students into the postdoctoral arena. This increased funding level for fellowships would result in a more cost effective method of stimulating manpower development and would produce a critical human capital mass within a reasonable period of time.

Institution Challenge Grants Program—$10 million per year. A $100 million Federal investment matched with $100 million in State and private funds over the next 10 years would stimulate significant improvement in the quality of food, agricultural, and natural resource higher education programs. Started in FY 1990, this program will stimulate curricular changes, augment faculty development activities, improve instruction delivery systems, recruit highly qualified students, enhance student experiential learning, and upgrade scientific teaching instrumentation. This initiative stems from the findings of a national project entitled "Operation Change" which set forth a long-term strategic plan developed by the food and agricultural sciences higher education system. Significant input for the plan was obtained from the Joint Council National Higher Education Committee, the Resident Instruction Committee on Organization and Policy, the American Association of State Colleges of Agriculture and Renewable Resources, the 1890 Land-Grant Institutions and Tuskegee University, the National Association of Professional Forestry Schools and Colleges, and the Association for Home Economics Administrators. "Operation Change" called for the revitablization of the infrastructure of the food and agricultural sciences higher education system to strengthen the educational programs primarily responsible for the development of future generations of food and agricultural scientific and professional expertise. A cumulative joint public and private effort of $200 million in this area would make a notable difference in the quality of the food and agricultural scientists and business leaders being trained by our colleges and universities.

1890 Institution Capacity Building Grants Program—$11 million per year. There is an urgent need to train more minority scientists and professionals to serve the Nation's food and agricultural system. The 1890 Land-Grant Institutions and Tuskegee University are major producers of this sorely needed human capital. The new 1890 Institution Capacity Building Grants Program will advance the teaching and research capacities of these institutions. This program will allow the 1890 institutions to undertake broader collaborative efforts with other universities and the private sector to launch special student recruitment programs, enhance curricula offerings, update and expand faculty expertise, implement innovative instructional delivery systems, and address high priority research initiatives. If provided with an annual funding level of $11 million per year over the next decade, the more than $100 million Federal investment, coupled with previous Federal initiatives on these campuses to construct modern research labs and to strengthen teaching programs, will move the 1890 institutions into the national competitive arena. If the Federal dollars are matched with more than $100 million in State and private funds, there is tremendous potential for achieving dramatic results in the area of mainstreaming minority expertise into the food and agricultural sciences system.

FOOD TOXICOLOGY

Mr. **Traxler**. This past year we have had consumers concerned by scares with Alar and other chemicals frequently used by production agriculture. Consumers should be assured of wholesome food products. They also should not be unjustifiably held hostage by inaccurate pronouncements of "science." Dealing with providing accurate answers to these kinds of food safety questions is one of the key missions of the Food Toxicology Center currently underway at Michigan State University. What is your current assessment of our ability to respond in a thoughtful and accurate fashion to these food safety concerns, and what role do you see for the Food Toxicology Center?

Dr. **Jordan**. The public appears to be preoccupied with the perceived risks from pesticides and other chemicals used on food crops. Science and logic are frequently lost in the ensuing debates which tend to focus on the spectacular and sensational. The public needs to better understand the real risks associated with eating.

The Department is moving on an initiative to develop a database on pesticide use and residues on food crops and to assess human exposure to pesticides in foods. Some scientists believe natural toxins in foods may pose a greater threat to human health than do pesticide residues. Research is underway at the production level to determine the routes, mode and amounts of toxic substances and harmful organisms transmitted through the food chain. Other research priorities in the food safety area are also being addressed. The land-grant colleges and universities are currently spending approximately $8.0 million of CSRS funds and $11.9 million of non-Federal funds on food safety research. The President's budget for 1991 is proposing a $10.8 million increase for food safety work conducted by ARS.

It is not enough to say that the U.S. has one of the highest quality, lowest cost, most abundant and varied, and safest food supplies in the world. We must continue to strive to assure the safety of the U.S. food supply. Though zero risk is unattainable, negligible risk must be defined.

The Food Toxicology Center at Michigan State University could provide coordinated research needed to effectively respond to regional or national incidents involving toxic contamination of the food chain, much the way the Centers for Disease Control respond to outbreaks of infectious diseases in humans and the Animal and Plant Health Inspection Service does for crops and animals.

LAKE STATES FOREST PRODUCTS TRADE CENTER

Mr. **Traxler**. Do you have any revised views regarding the proposed Lake States Forest Products Trade Center which we discussed last year?

Dr. **Jordan**. The proposed Lake States Forest Products Trade Center mission would include all the forest products of the North Central region including solid wood, wood composite products, and fiber products. This center would thus be complementary to the International Trade Development Centers in the Northwest and in Appalachia, each of which focuses on the forest products in their respective regions. Michigan State University, Michigan Technological University, the University of Wisconsin, and the University of Minnesota plan to combine their resources in working with the research, education, technology transfer, and outreach issues important to the forest products industry. I have no additional views on this Center. As you know, the President's budget did not request funding for any of the International Trade Development Center programs.

MICHIGAN SPECIAL GRANTS

Mr. **Traxler**. Would you once again provide an update on the work conducted by each of the special grants underway in Michigan?

[The information follows:]

Apple Quality Research. Research carried on by the Michigan State Agricultural Experiment Station is evaluating factors affecting apple quality, including surface color, shape, ripeness, firmness, texture, flavor, sugar to acid ratio, and blemishes and bruises. Research on handling, storage, and transportation procedures has resulted in a better understanding of the physical and environmental factors which influence the harvesting, handling, and storage of apples. Recommendations have been made and techniques developed to reduce bruise damage due to production, handling, storage, packing, and distribution techniques.

Asparagus Yield Decline. Research on the embryogenesis portion of the project is complete, and a protocol for producing somatic, embryo-derived asparagus plants has been developed. Asparagus protoplasts research is continuing to develop techniques that will improve planting efficiency and preparing protoplasts for subsequent fusions with resistant species. Cruciferous cover crops were evaluated for suitability in managing populations of the Fusarium pathogen. To date, 340 somatic embryo-derived liner plants have been planted into the field. The basis for mass production is available. Protoclones derived for "Jersey Giant" and somaclones from "Lucullus" show a fairly normal distribution in their susceptibility to both *Fusarium* species. Five percent of the most resistant somaclones and protoclones are being retained for further screening. Protoplasts have been successfully isolated from "Lucullus 234" and "Jersey Giant". The soil will be assayed for the level of *Fusarium* and asparagus planted as a bioassay crop. The field will be replanted to asparagus in 1991. In 1990 emphasis will be to confirm the *Fusarium* resistance that has been identified and develop techniques for incorporating this resistance into clones for field testing or into an already horticulturally acceptable asparagus cultivar. In addition, the utilization of cover crops and mycorrhizal fungi in a production system that enhances *Fusarium* tolerance will be pursued.

Bean and Beet Research. The research conducted to date has enabled researchers to determine the agronomic limitations to lowered production costs, to determine the extent of dry bean losses under different harvesting methods, to evaluate the integration of forage legumes into economically efficient cropping systems for dry beans and sugar beets, to breed navy and pinto beans for drought stress tolerance and to quantify root development and functional efficiencies of sugar beets.

Blueberry Shoestring Virus. Research in fiscal year 1989 involved evaluation of the progency of blueberry crosses for resistence to infection by the blueberry shoestring virus, BBSSV. Work continued on evaluation of wild blueberry clones from across the United States and abroad. Research continued on genetic transformation of horticulturally-valuable, BBSSV-susceptible blueberry varieties into resistant types. Research on another serious blueberry disease, blueberry leaf mottle virus, BBLMV, involves study of means of spread of the virus. In a diallele cross of six commercial blueberry varieties with varying levels of BBSSV resistance, crosses involving "Elliott" were the most susceptible, while "Earliblue" and "Bluecrop" progency were the most resistant. Almost 500 clones of wild blueberries from 11 States and Canadian provinces were ELISA-tested for BBSSV. Virus infected plants were found at several locations in the midwestern and eastern United States, but were not found in the southeastern United States. A second economically serious virus causing disease of blueberry is blueberry leaf mottle virus, BBLMV. This virus is pollen-borne, i.e. infects the blueberry pollen and is spread by honeybees. Research done during 1989 has shown that bees will leave their hive, forage in an area, pollinating blueberry bushes and then visit other hives up to 1600 meters away, which could contaminate those distant hives and thus effectively spread the virus quickly from one field to another. Information has been given to growers regarding management strategies for hive placement to minimize honeybee-mediated spread of BBLMV.

Celery Fusarium. Research work at Michigan Agricultural Experiment Station during fiscal year 1989 focused on celery genetics and breeding, celery tissue culture and somaclonal variation and induction of host plant enzymes as a pathogen defense mechanism in expression of disease resistance. Nineteen lines and cultivars of celery were screened in the field for resistance to Fusarium oxysporu, f. sp. apii race 2 in naturally infested field sites at two locations. Most of the lines were highly susceptible to Fusarium yellows; only one of the lines showed even moderate resistance. Since these lines would require extensive backcrossing for acceptable horticultural characteristics, they will not be used further. Experiments have been performed to study the role of hydrolytic enzymes in celery resistance to Fusarium yellows disease. Two enzymes exhibited different response profiles. This demonstrated ability of chitosan to induce hydrolytic enzyme activity makes it possible to test the effect of pre-induction of these enzymes on the responses of celery plants to *Fusarium* infection. If pre-induction leads to enhanced resistance, support will be lent to the hypothesis that increasing the expression of these enzymes via genetic engineering may increase the level of Fusarium yellows resistance in celery.

Dairy and Beef Photoperiod. Michigan State University scientists continued research on the effect of controlled photoperiods on various growth responses of cattle during FY 1989. Eight scientific papers including abstracts, were published during 1988–89. Long days and high-intensity daily light increased the concentration of prolactin in young male cattle. Prolactin response to photoperiod was independent of the testis function. Short durations of daily light favored fat accretion, whereas long-day photoperiods favored protein accretion. Feed tests with the hormone melatonin increased the percent fat and decreased percent protein in carcasses of growing heifers. Melatonin feeding associated with short days reduced mammary growth, milk yield and increased fat. Plans for 1990 involve further study on the physiological mechansims whereby photoperiod affects mammary development, lactation rates and composition of gain in the bovine. Hormonal interrelationships among melatonin, prolactin and growth hormone will be studied in lactating cows administered exogenous melatonin during controlled photoperiods. Additional information will be obtained on milk yield, milk constituents and body composition. These experiments will enhance our understanding of the role of melatonin in the suppression of lactation associated with short-day photoperiods, and this knowledge will aid the development of new methods to control these economically important traits.

Michigan Biotechnology Institute. Michigan State University is developing and demonstrating cost effective technology for bioprocessing of agricultural raw materials to value added products, including industrial chemicals, food and feed. During the first year of the Institute's program their research focused on novel fermentation, hydrolysis, and enzymatic transformation and separation technology that can be applied to add value to raw agricultural materials. This research is intended to lead to commercial applications through the Institute's technology transfer mechanism. The Institute also anticipates developing bioprocess technology to manufacture products that will lead to new market outlets of agricultural raw materials, thereby increasing their utilization and reducing surpluses.

Minor Use Animal Drugs. The North Central Region IR–4 Leader Laboratory at East Lansing, Michigan is currently managing six ongoing projects. Two projects involve the use of the drug, ivermectin. It is being reviewed for the treatment of hypodermosis in the American Bison and ear mites in the fox. The use of fenbendazole for the control of gastrointestinal parasites in goats is also being investigated. Praziquantel continues to be studied for use as a control for schistosomiasis in ducks and geese. Another project is investigating the use of chloramine-T in salmonids for control of bacterial gill disease. A new project involves the use of spectinomycin for the control of salmonellosis and colibacillus in ducks. Each project involves the cooperation of a pharmaceutical company and either a university or Federal agency.

Pesticide Clearance. The Pesticide Research Center at Michigan State University is one of four leader laboratories, in addition to a headquarters staff in New Jersey, that is an integral part of a national pesticide clearance effort. Funds are divided equally between these five institutions. Two major areas of research are in food and ornamental pesticide clearance and biorational or biological control. Most of the

Michigan State University effort has been in the pesticide clearance area. During fiscal year 1989, the North Central region completed and sent to IR-4 Headquarters 31 efficacy reports and 40 residue reports. For ornamentals, 17 projects were completed. At the North Central Regional Liaison meeting in 1987, a list of 1,141 potentially researchable food crop uses were identified. For ornamental uses, 629 potentially researchable projects were identified. One project was funded using a fungal pathogen as a biorational control agent for the weed annual bluegrass in turf.

Potato Research. Potato research at the Michigan Agricultural Experiment Station has been and continues to be concerned with yield enhancement of insect and disease resistant potatoes through genetic improvement and variety development, integrated crop management, and storage management for seed, tablestock, and processing potatoes.

Stone Fruit Decline. Research supported by fiscal year 1989 funds consisted of several coordinated interdisciplinary thrusts among several departments at Michigan State University. Research efforts consisted of studies on cold injury and bacterial canker; identification of root-related problems; control of *Cytospora* canker of peach; evaluation of harvest systems; applied and basic research on X-Disease and viruses; and design of crop management systems as a basis for grower decision support systems. Rootstock selection for cold hardiness is a major determinant of site selection and cultivar of choice. Ice nucleating bacteria, INA, were found in only one of 32 sweet cherry orchards and 12 of 31 tart cherry orchards during periods when trees were not susceptible to drought. Poor soil structure was found to be the greatest single factor contributing to sour cherry decline. For *Cytospora* canker control, no commercial recommendation can be made at present. A new pad harvest system was developed for young trees. A stone fruit pathogen, tomato ringspot virus, was found to be spread by dagger nematodes. Molecular research involved development of cDNA probes against X-Disease. In cultural systems work, accelerated production of peach seems feasible. New cultivars of plum have been brought into Michigan orchards and they all produced good yields. Future work will be intensified on cold hardiness, root-related problems, cherry and peach cankers, molecular probes for X-Disease, viruses and selected bacteria, and building on the design of grower decision support systems.

Subirrigation Research. The work supported by this grant begins in fiscal year 1990. Michigan State University has submitted a proposal and it has been reviewed. The research will focus on development of subirrigation technology that reduces negative impacts of agricultural chemicals on water resources while sustaining productivity. The anticipated results will lead to the development of subirrigation as a Best Management Practice in terms of productivity, profitability, and the control of environmental impacts.

North Central Aquaculture Center. The North Central Regional Aquaculture Center is located at Michigan State University. Research has focused on a number of important species including walleye, crawfish, yellow perch, and hybrid striped bass. Projects have addressed marketing, economics, genetics, reproduction, and nutrition. Extension educational materials have also been developed.

Wood Utilization. The results of the work being accomplished and the studies underway have been documented in two publications: "Advanced Technology Applications to Eastern Hardwood Utilization," Volumes 1 and 2, Department of Forestry, Michigan State University. Michigan State University, Department of Forestry, is coordinating research dealing with eastern hardwoods in cooperation with researchers in seven other universities.

Among the results to date are studies on composite materials that include wood or wood fiber as a portion of the matrix. These materials hold great promise as replacement materials for metal panels and construction. Studies have shown that composites containing wood fibers can replace other materials in portions of automobiles. Properties of concrete product composites are improved through the addition of wood fiber. Major improvements in the flexure strength and toughness—energy absorption capacity—of cementitious materials result when wood fibers—mechanical, softwood kraft, and hardwood kraft—are added to the cement mix. When a 2% by weight of softwood kraft fibers are added to cement test specimens, flexural strength increased about five fold and toughness increased twenty times. As the nation's manufacturers learn to exploit the properties of these composites and the wood-based producers assimilate the results of the studies of these engineered materials, the wood industry may benefit as it recognizes increased markets for composites.

In the wood chemistry research, several results are significant: 1). A methanol extract of black locust has proven to provide decay resistance to aspen, a species easily decayed. Patent application has been made; 2). The essential oils from the tulip tree have a high unit value for flavor and aromatic uses. If economically feasible extraction procedures can be developed, a new industry would evolve; 3). The enzyme chalcone isomerase regulates the production of robinetin and dihydrorobinetin in black locust. These two chemicals impart decay resistance to this species.

Safety has always been a concern of the wood industry. The program dealing with Automated Lumber Processing—ALPS—has as a major emphasis worker safety. As this phase of the work continues, it is evident that the new technology being developed will reduce operator risk. In addition, application of the ALPS can result in economic savings and the economic impact to the wood industry is considerable.

Presently, approximately thirty studies are in various phases from start to completion. A seminar is scheduled for May 30-31, 1990, in which many of the eastern hardwood studies will be discussed. Another meeting in early fall is being planned to collate the results and examine the direction of the ALPS research.

Mr. WHITTEN. Mr. Weber?

ANIMAL RIGHTS VS. ANIMAL WELFARE

Mr. WEBER. Dr. Jordan, as you may know I have taken a real interest in the animal rights vs. animal welfare debate. We all understand the need to promote, in a responsible way, the welfare of animals. However, I am concerned about the direction that the debate is now taking. As I see it, certain animal rights groups are now trying to get us to question whether or not we as a society should be able to use animals for any purpose. I am wondering what your views are on this matter and if your department is currently working with any universities on research projects utilizing animals? If so, have any of the researchers to your knowledge been threatened?

Dr. JORDAN. My view is that the care and treatment of agricultural animals must always be humane. Man has a special relationship with and obligation to the animals under his stewardship. From the earliest times, animals have been central to our civilization. This human-animal association has also been of mutual benefit to domesticated animals resulting in their improved care and health.

Demonstrations, break-ins, thefts and property destruction by animals rights activists have largely occurred in laboratory animal facilities not directly involved in agricultural research, but security has become a high priority in most farm animal research facilities. Acts of physical violence and other activities of animal rights activists directed toward scientists to halt the use of animals in experimentation are very disturbing. The costs of such activities to the scientific community are difficult to assess, but they extend far beyond the physical damage to animal facilities. Animal research in new technologies for efficient food and fiber production, especially animal biotechnology, is crucial to an economically viable animal agriculture and reasonable food costs for the consumer. It is impossible to estimate the actual cost to society when needed research is not undertaken or critical experiments are not conducted because of unwarranted restrictions on the use of animals in research.

Animal health and well being, that is to say animal welfare, have been and remain important components of animal research programs in the various Land Grant Universities funded by CSRS. Comprehensive and reasonable standards for the care and use of farm animals in agricultural research and teaching programs were developed in 1988 by a consortium of nationally respected agricultural scientists. These guidelines are currently being used by Institutional Animal Care and Use Committees of Land Grant Universities to evaluate and approve animal protocols for CSRS sponsored research. Many of the individual animal research projects funded by CSRS deal in part with animal well being and health. These animal welfare studies have included areas such as animal care, housing, handling, transport and stress and pain control. The study of animal diseases and their prevention and control remains a major thrust in our research programs.

LOW INPUT SUSTAINABLE AGRICULTURE PROGRAM

Mr. **Weber**. Dr. Jordan, I have noticed that the Department has asked for an increase in the Low Input Sustainable Agriculture program. In addition to this program, there are a number of other LISA research projects being conducted around the nation. I am wondering if you could explain to me the need for the increase and if you feel that there is in fact already enough LISA research being conducted?

Dr. **Jordan**. The Department is requesting an increase in funding for the LISA research and education program to restore it to the funding level available prior to the Gramm-Rudman-Hollings reduction. We have recommended $4.45 million for this program. Considerable research conducted by the Department and at universities contributes to our knowledge and understanding of sustainable farming methods. But to provide farmers with reliable information on environmentally and economically sustainable practices, we have to look at the whole farm as a system and piece together the findings of contributing, component research through what many call a systems approach. That is LISA research. Not only does the LISA program move closer to providing farmers with important information in the right form, it can also guide and increase the relevance of component research. So, these two kinds of research are not either-ors. They depend on each other. LISA research is designed to effectively combine and extend good component research.

Mr. **Whitten**. Mr. Myers could not be here today and he has several questions he would like answered for the record.

[The questions and responses follow:]

National Research Initiative

Mr. **Myers**. Please explain how you perceive the Program Plan for the National Research Initiative to evolve over fiscal years 1991 to 1995?

Response. The National Research Initiative is proposed to increase in increments of $50 million each year through FY 1995 to a level of $300 million. Currently four of the essential six major research areas are recommended for funding. These include animal systems, plant systems and nutrition, food quality and health, which are currently funded through the Competitive Research Grants program, and a new area, natural resources and environment. Our current plan is that the next level of funding, proposed at $150 million for FY 1992, would add two new research areas, which are: market, trade, and policy and processes antecedent to adding value and developing new products. Of the original four research areas new increases are also planned for natural resources and environment, and nutrition, food quality and health at the $150 million level. We will provide the Committee with copies of the Program Plan for the Initiative.

Mr. **Myers**. What is the rationale behind the proposed distribution of funds to the various program areas and initiatives? For example, why is only $15 million allocated to the problems of natural resources and the environment, which is arguably more urgent than other projects, and $50 million is proposed for plant systems?

RESPONSE. The National Research Initiative includes the current Competitive Research Grants program funded through 1990. Within that program in the FY 1990 budget the plant sciences account for $30,103,000, including: biotechnology, pest science, forestry, and stratospheric ozone. The two new programs proposed in the Initiative are Natural Resources at $15 million and plant genome mapping at $15 million. The remainder of the increase will provide modest increases in the plant systems, animal systems and human nutrition components to raise the grant levels from an average of $56,000, per year, extend the time of grants from an average of 2.2 years, and improve the success rate from around 20 percent. This expanded program will more closely follow patterns of the National Science Foundation and the National Institutes of Health.

As the funding level increases each year the natural resources area is scheduled for the fastest growth. Ultimately this area will be the largest research area of the six research areas in the Initiative, $140 million of the $500 million goal.

Mr. MYERS. Where does the Extension Service fit into the National Research Initiative? Is Extension part of the planning and execution efforts?

RESPONSE. The Extension Service—ES—has a vital role to play in technology transfer in the National Research Initiative. The Assistant Secretary for Science and Education has established a board to coordinate the Initiative which includes the Administrator of ES along with the Administrators of the Cooperative State Research Service, Agricultural Research Service, Economic Research Service, the Deputy Chief for Research of the Forest Service, and the Chief Scientist of the Competitive Research Grants Office. This Board is designed to assure that the Initiative relates to all USDA agencies, as appropriate, as well as the scientific community as a whole.

Mr. MYERS. What will be the role of the National Research Initiative with regard to environmental issues?

RESPONSE. One of the key issues included in the National Research Council's report recommending the National Research Initiative was the need for a strong environmental component in relation to agricultural research. One of the six research areas identified for research support is "Natural Responses and the Environment." In the $100 million proposal, $15 million is identified for natural resources research in the areas of global change, water quality, and sustainable agriculture. This area is eventually scheduled to receive the highest funding of all six research areas at the $300 million level and the $500 million level of the Initiative.

Mr. MYERS. What would be the impact on the National Research Initiative if the program were only partially funded?

RESPONSE. The Program Plan for the National Research Initiative calls for an eventual funding level of $500 million per year. In assessing the realistic environment for initial funding of the Initiative, it was determined that a minimum level to retain the essence of a National Research Initiative would be $100 million. Funding at this level will be critical to fund programs in the four major categories identified in 1991—plant systems; animal systems; nutrition, food quality and health; and natural resources and environment. The $100 million level provides resources to fund grants at levels more comparable to awards made through programs of NIH and NSF. I would also emphasize that the Administration's commitment to future funding increases in this area is contingent upon favorable Congressional action on our 1991 proposal. Future increases will provide resources to initiate programs in research on new products and processes and markets, trade and policy. Research in these areas, along with expanded programs in areas initiated in 1991, will form the basis to address a wide spectrum of critical issues facing farmers and ranchers.

Mr. WHITTEN. Mr. Chapman, a member of the Committee has several questions which he has requested that we have answered for the record.

[The questions and responses follow:]

BOVINE LEUKEMIA

Mr. CHAPMAN. I am very concerned about a virus disease of cattle called Bovine Leukemia, also referred to as Bovine Leukosis or BLV. All dairy and beef breeds are susceptible to this virus and I have read reports which indicate that a high percentage of U.S. cattle test positive for the disease. Of those animals infected, not all will exhibit signs of the disease. However, individual producers with animals who do show signs of the disease can experience severe economic losses due to condemnation of carcasses at slaughter, breeding and health problems, and decreased milk production in dairy cows. Furthermore, a major economic impact in the future may be the potential loss of income from exporting U.S. breeding stock to other nations who are increasingly restricting the movement of BLV-infected cattle in international trade. Diagnostic procedures have been developed to detect the presence of this virus, the USDA has approved many laboratories to conduct these tests, and test methods now seem adequate to allow the development of programs to eradicate BLV; however, no vaccine is currently available to produce immunity to this disease, no pharmaceutical companies are actively developing a vaccine at this time, and there seems to be little attempt to study ways to control or eradicate BLV infection. I have a series of questions I would appreciate your responding to in this regard. Has the CSRS ever provided funding support for studying the number of incidences of this disease nationwide, developing a vaccine for this disease, or exploring methods to control or eradicate this infection? If so, could you please provide information in regard to programs on this subject?

RESPONSE. Land-grant colleges and universities and colleges of veterinary medicine are conducting research to study the etiology, incidence, pathogenesis, immunology and diagnosis of bovine leukosis, using CSRS as well as non-Federal funds. As a result of studies in the U.S. and in other countries with large dairy industries, a considerable amount of information on bovine leukosis is available. Diagnostic tests are available which could meet the needs of a control program. Studies are also being conducted on the incidence and epidemiology of bovine leukosis. Although no large nationwide studies have been undertaken, the structure for such a study is being developed as part of the National Animal Health Monitoring System dairy study to be initiated in 1991 by the Animal and Plant Health Inspection Service.

There are also studies on vaccines for bovine leukosis. Basic research on the pathogenesis of bovine leukosis and protective mechanisms is required. In this regard although there is no evidence of transmission of bovine leukemia virus to the human, some of the basic problems which must be addressed are shared with human leukemia.

Mr. CHAPMAN. Because this disease is prevalent all across the U.S., do you feel there could be a federal role in providing research and guidance, either for states or individuals, in regards to assisting producers in establishing bovine leukemia-free herds?

RESPONSE. In any effort to control bovine leukosis, APHIS would be the lead agency with research support from CSRS and ARS. Special efforts are made to coordinate CSRS and ARS research priorities with the program needs of APHIS.

It is my understanding that possibilities for control and eradication of bovine leukosis have been studied by APHIS. The feasibility has been demonstrated in Denmark where the disease has been successfully eliminated. The problem in the U.S., however, differs from that in Denmark because of markedly different dairy herd size and management. Approximately $800,000 of CSRS and non-Federal funds is spent on bovine leukosis research by colleges and universities.

Mr. CHAPMAN. Would funding programs of this type fit within the scope of the CSRS and do you feel the CSRS would be supportive of providing assistance for programs that seek to establish bovine leukemia-free herds?

RESPONSE. Research on bovine leukosis is currently being conducted by the land-grant universities and colleges of veterinary medicine. This research fits within the scope of programs administered by CSRS.

Dr. JORDAN. Thank you, Mr. Chairman.

Mr. WHITTEN. Thank you for your appearance.

COOPERATIVE STATE RESEARCH SERVICE

Statement of Dr. John Patrick Jordan, Administrator of the Cooperative State Research Service (CSRS) before the Subcommittee on Rural Development, Agriculture, and Related Agencies.

Mr. Chairman and Members of the Subcommittee: The Cooperative State Research Service is the agency of the USDA through which Federal research funding for the States is channeled and coordinated on behalf of the Department of Agriculture, in cooperation with all of the State and Territorial Agricultural Experiment Stations; the Colleges of 1890, including Tuskegee University; all of the Forestry Schools; and all of the Colleges of Veterinary Medicine in the United States. In addition to land grant universities, there are other universities, not of the land grant model, which are participants in the system. All of these institutions operate as a very effective system to jointly address regional and national needs as well as their particular State and local agendas.

REPORT OF SELECTED SIGNIFICANT ACCOMPLISHMENTS

There are a number of exciting advances that I would like to report to you. The application of Integrated Pest Management (IPM) principles at the North Carolina Agricultural Experiment Station has led to a more economically and environmentally acceptable system of combating a pest complex of soybeans. Soybean fields predicted to have a soybean cyst nematode problem can also be expected to have increased weed and insect problems and negligible profit potential. As a result of an IPM Special Research Grant study, North Carolina will recommend crop rotation as the most economically feasible means of combating soybean cyst nematode and the associated pest problems. The combined inputs for nematode, insect and weed control make soybean production economically prohibitive where soybean cyst nematode populations are present.

In Indiana, researchers supported with Hatch Act funds have developed an instrument that assesses the fat percentage of hog carcasses in a few seconds. Applicable to both individual cuts and whole carcasses, the technology will help pork packers provide better and more uniform quality cuts to consumers. The technology also may be useful to producers who need immediate, accurate feedback regarding animal leanness when making breeding and production decisions.

Limited resource farmers, who produce fruits and vegetables, need an inexpensive means of precooling and temporarily storing their products in order to get better products to market. In Georgia, at Fort Valley State College, researchers were issued a U.S. Patent on a container that can be used for precooling, shipping and storing. The cost of shipping fruits and vegetables will be reduced, since the container is insulated and will permit shipping products several hundred miles in nonrefrigerated vehicles. The containers are reusable; therefore, the cost of shipping containers will be reduced. This research was supported with Evans-Allen funds.

Pseudorabies is a significant and costly disease of swine resulting in productivity losses and death in young animals. Since pseudorabies is caused by a herpesvirus, recovered swine serve as a source of latent infectious virus. It was not known whether this latent infection was localized in the lymphoid or nervous system. Using molecular biology techniques, researchers at the

University of Nebraska have found that the herpesvirus establishes a latent infection in the nervous system of swine. This is similar to the cold sore virus in humans. It is hoped that these techniques can be adapted to a quick diagnosis system so that infected swine can be identified and removed from the population. This research was funded from the Competitive Research Grants program.

NATIONAL INITIATIVE FOR RESEARCH ON AGRICULTURE, FOOD, AND THE ENVIRONMENT

Agriculture in the 1990's must provide better stewardship of the environment, more rational use of natural resources, improve the quality and nutrition of food and economically stabilize production systems in order to continue to benefit producers as well as consumers. In 1991, $100 million is being proposed for a new National Initiative for Research on Agriculture, Food, and the Environment which will respond to the major issues facing agriculture such as food safety, water quality, global climate change, pest management, scientific human capital development and farm income and market competitiveness. It will allow U.S. agriculture to broaden the science and technology base to more effectively meet these demanding needs and exploit new opportunities. These imperatives coincide with recent advances in biological science and other new tools in science that present unique research opportunities to improve agriculture nationally.

As Secretary Hess has already alluded, a recent report from the Board on Agriculture of the National Academy of Sciences' National Research Council (Investing in Research: A Proposal to Strengthen the Agricultural, Food, and

Environmental System) recommends the establishment of this Initiative with new funding of $500 million per year. The Initiative has evolved as a broad national consensus of USDA research agencies, Federal and state scientists, conservationists, environmentalists, consumers, producers and processors of food and fiber along with related industries. Congruent with this recommendation, the USDA and its cooperators, in their national planning activities, have identified virtually identical national research initiatives that require major funding for the national good.

The CSRS budget request includes $100 million to begin this Initiative in 1991. There are six research components proposed in the Initiative and the $100 million request will fund four of these components in 1991. This request includes $15 million for Natural Resources and the Environment which consists of $9.4 million for global change, $4.6 million for water quality, and $1 million for sustainable agriculture; $5 million for Nutrition, Food Quality and Health; $50 million for Plant Systems including $15 million for the plant genome mapping program with the Agricultural Research Service as the lead agency; and $30 million for Animal Systems. The Initiative includes a commitment for annual increases of $50 million, provided that funds are made available for competitively awarded grants. The plan for subsequent years includes programs in Processes that Lead to New Products and Adding of Value and Markets, Trade and Policy.

Federal funding for the Initiative is necessary because: (1) the issues and opportunities are national in scope; the nation as a whole is the beneficiary of this effort, not just individual states or industries, (2) the Initiative undertakes research that does not in general produce specific patentable or marketable products, but knowledge that will be broadly applicable, (3) the need is urgent; the issues described below require action now and cannot be delayed or taken up piecemeal, (4) the health and vigor of a major segment of U.S. industry is at stake in terms of international competitiveness, and (5) there are benefits, although difficult to measure in economic terms, related to protection of the environment and public health.

The demands upon agricultural science for new knowledge have far outstripped the capacity for the USDA budget to provide needed leadership to a national agenda. Consequently, critical opportunities are missed, such as the relatively slow applications of biotechnology to agricultural uses; slow development of new crops for greater diversity or crops with improved nutrient composition, safety and post harvest quality; too few projects make use of science to improve and/or protect the environment and preserve natural resources and not enough effort is expended to reduce U.S. agricultural production cost or increase product value, which are seen as necessary first steps for increasing farm profitability and America's long term international competitiveness in agriculture.

The Federal laboratories and State Agricultural Experiment Stations (SAES) have provided the foundation for the development of technology for vastly improving agricultural production. Much of this is done through direct and formula funding which ensures a long-term stable base of support for certain kinds of research known to be important to agriculture. Formula funding also has the unique advantage of several fold leveraging of state support through matching funds. Both intramural programs and national focused State Agricultural Experiment Station programs are important to maintain national thrusts in agricultural research in established laboratories. The overall missions of these intramural programs can be defined and adjusted on a regular basis. Extramural programs, such as the Federal-state partnership of the State Agricultural Experiment Stations and other cooperating institutions provide attention to national, regional and area agricultural problems. Both programs are vitally important to the successful development of agricultural technology.

Present Departmental funding for research provides less than 5 percent for competitive research grants. The proposed Initiative would be a first step in resetting the balance with new funding to eventually reach a significantly greater portion of the total funding for research available from competitive research grants.

As the National Academy of Sciences report points out, "the delivery system -- SAES scientists and Extension specialists and advisors, in combination with government and the private sector...is already unduly stressed and redirection would exacerbate staffing insufficiencies for both CES and SAES." Redirection of resources would do the same to the intramural Federal laboratories. The National Academy of Sciences' report concludes that there is both an overall shortage of funding and a major deficiency in the competitively awarded funds. The Department of Agriculture concurs with this conclusion.

A major infusion of new funding is needed to allow the strengths of each research funding mechanism to do best what each is designed to accomplish. It is not simply a choice of one mechanism over another, but an intended synergy of mechanisms. Each mechanism supports the others through a balanced addressing of the entire spectrum of agricultural research needs.

It is well accepted that fundamental investigations to support a national research agenda can be effectively achieved through a competitive research grants program. A competitively awarded National Initiative could strengthen the USDA intramural program, since USDA scientists are eligible to compete for the grants. It would also strengthen the extramural program by extending support to other outstanding scientists to address national agriculture and natural resource problems.

The Initiative calls for a major infusion of new Federal funding for research that addresses a set of societal and industrial issues. It recognizes that there are major untapped opportunities for improving U.S. agriculture and natural resources in modern biological and related sciences, especially in biotechnology and computer sciences, to address the most critical problems.

Approximately 70 percent of the effort proposed in the Initiative will support fundamental research directed at the most urgent problems. It is from this form of science that major conceptual breakthroughs are expected to emerge. Fundamental research projects will be both individual investigator grants (40 percent) and multidisciplinary team research grants (30 percent). Other forms of grants will be directed at mission-linked multidisciplinary studies (20 percent), as well as institutional strengthening grants (10 percent).

Funds will be awarded on a competitive, peer reviewed basis. This form of funding mechanism is uniquely suited to stimulating new research activity in specific, high-priority areas of science and engineering. All public and private universities, research organizations, Federal agencies, private organizations or corporations, and individuals will be eligible to compete for these funds. The Initiative will allow the average amount of USDA competitive research grants to be increased and the average duration to be extended. This will make USDA competitive research grants more comparable in size and length to grants awarded by the National Science Foundation and the National Institutes of Health.

The research agenda for the Initiative is both extensive and intensive. The needs for the research are enormous and the opportunities are at hand. The Initiative is a bold step forward to provide the scientific basis to assure agricultural productivity for future generations in ways that are compatible with the environment, safe for the consumer and viable for the producer.

BUDGET RECOMMENDATION

The CSRS budget recommendation for fiscal year 1991 is $346,893,000 which includes the $100 million for the National Research Initiative which replaces the current Competitive Research Grants program. We are fully appreciative of the overwhelming need to reduce spending in the Federal government, but this budget continues to reflect strong support for the State-Federal partnership in food and agricultural research and education. The Hatch, McIntire-Stennis, and Evans-Allen programs are the foundation upon which the remaining Federal funds including special and competitive research grants plus State and private industry funds build. Funding of these base programs is a high priority because they support the basic laboratory facilities, scientists, and graduate students necessary for the long-term stability of agricultural research. These programs allow the institutions maximum flexibility to support research of the highest priority and at the same time assure the strong working relationship between the USDA and the State Agricultural Experiment Station system. An increase of

$3,487,000 is proposed for the Hatch Act. A decrease of $4,304,000 is proposed for the McIntire-Stennis program, however, funds for forestry research will be available on a competitive basis through the National Research Initiative. The budget recommendation contains a $1,157,000 increase for the Evans-Allen program which will support increased research consistent with a broader USDA initiative to strengthen the contribution of the 1890 institutions to agricultural and natural resources research and education.

The CSRS budget request includes funding for selected Special Research Grants which address important national needs such as integrated pest management, minor use animal drugs, the National Biological Impact Assessment program, pesticide clearance, pesticide impact assessment, low-input sustainable agriculture, and alternative and supplemental crops. As a part of a coordinated Federal water quality initiative, CSRS is requesting $10.0 million to conduct water quality research in the Midwest Corn Belt and in other major agricultural production regions consistent with the USDA Research Plan for Water Quality. A new grant program for global change is also being requested at a $5 million level for research at universities as part of a Federal initiative coordinated by the Committee on Earth Sciences. Emphasis of this work will be to gain a better understanding of agricultural contributions of methane and other gases to the atmosphere and to develop new strategies to ameliorate those impacts. Funds will also support a network to monitor ultraviolet-B levels.

HIGHER EDUCATION

We are extremely pleased this year to include in the budget an approach begun in 1990 to strengthen higher education in the food and agricultural sciences. We are proposing a finely tuned, integrated program which includes the Graduate Fellowships and Institution Challenge Grants programs. We are also proposing a doubling of the capacity building grants program for the 1890 institutions.

The National Needs Graduate Fellowships Program recruits and trains doctoral and master's fellows in targeted shortage areas such as biotechnology, bioprocessing/engineering, food science/human nutrition, marketing, and water science. Grants are awarded competitively to institutions identified via the peer review process as offering excellent teaching and research programs in the targeted areas. CSRS is requesting $4 million in 1991. This program was initiated in 1984 and has served to attract more than 400 superior new graduate students from a broad array of academic backgrounds into high priority disciplines. It is very likely that without the fellowships program these students would not be pursuing graduate study today in a food and agricultural discipline.

The Institution Challenge Grants Program is designed to revitalize the educational system which is primarily responsible for training food and agricultural scientists and professionals. It stimulates the private sector to match, dollar for dollar, the Federal partner in providing support to strengthen the infrastructure of the U. S. food and agricultural sciences higher education system. This $2 million program will foster partnership ventures among universities, industry, and government. Areas of partnership initiatives include curricula revitalization, faculty development, scientific instrumentation for teaching, undergraduate research including minority participation, and student recruitment and retention.

The 1890 Institutions Capacity Building Grants Program serves as the crux of the Department's high priority initiative to advance the capacity of the 1890 institutions and Tuskegee University. CSRS is requesting $11 million for this program. It is a competitive program and requires cooperation with one or more USDA agencies in developing a proposal and in carrying out the capacity building project as well as an academic institution with a recognized center of excellence which directly relates to the objectives of the proposal. In accordance with direction from the Committee, we are encouraging institutions to obtain matching funds. Given indications of success, we are proposing that in 1991 the awardee institution be required to obtain a dollar-for-dollar match from a non-Federal source. Funds will be targeted to initiatives which transcend the capability of a single institution to achieve. The program is designed to encourage expanded linkages with 1890 institutions as performers of research and developers of scientific and professional talent for the food and agricultural system.

Mr. Chairman, that concludes my prepared remarks. I will be pleased to answer any questions.

COOPERATIVE STATE RESEARCH SERVICE

Purpose Statement

Cooperative State Research Service is the U.S. Department of Agriculture's principal entree to the university system of the United States for the purpose of conducting agricultural research as authorized by the Hatch Act of 1887, as amended (7 U.S.C. 361a-361i); the Cooperative Forestry Research Act of 1962, as amended (16 U.S.C. 582a-7); Public Law 89-106, Section (2), as amended (7 U.S.C. 450i); and the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended (7 U.S.C. 3101 et seq.). Through these authorities, the U.S. Department of Agriculture participates with State and other sources of funding to encourage and assist the State institutions in the conduct of agricultural research through the State Agricultural Experiment Stations of the 50 States and the territories; by approved Schools of Forestry; the 1890 Land-Grant Institutions and Tuskegee University; Colleges of Veterinary Medicine; and other eligible institutions.

Cooperative State Research Service participates in a nationwide system of agricultural research program planning and coordination among the State institutions, U.S. Department of Agriculture and the agricultural industry of America. Program coordination and planning are carried out by a Cooperative State Research Service staff located entirely in the Washington, D.C. area. This headquarters unit serves more than 12,000 scientists in the university system of the United States. As of September 30, 1989, there were 158 full-time employees and 13 other than full-time employees.

COOPERATIVE STATE RESEARCH SERVICE

Available Funds and Staff-Years

1989 Actual and Estimated, 1990 and 1991

Item	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Direct Appropriation:						
Cooperative State Research Service	340,917,000	157	340,478,000	155	349,743,000	183
Buildings and Facilities	- -	- -	45,108,000	10	- -	- -
Total, Direct Appropriation	340,917,000	157	385,586,000	165	349,743,000	183
Obligations under other USDA appropriations:						
Agricultural Marketing Service, 1890 Scholarships	6,000	- -	- -	- -	- -	- -
Agricultural Research Service:						
Air Contaminant Symposium	1,000	- -	- -	- -	- -	- -
Biotechnology Exhibit	2,928	- -	- -	- -	- -	- -
Evaluation Studies	300,258	- -	400,000	- -	400,000	- -
Fallen Leaf Conference	2,000	- -	- -	- -	- -	- -
Groundwater Quality Conference	10,000	- -	- -	- -	- -	- -
Science and Education Programs	250,000	- -	304,693	- -	304,693	- -
Office of Small Scale Agriculture	75,157	1	80,925	1	80,925	1
Office of Special Projects and Program Systems	20,997	1	22,439	1	22,439	1
Soil Erosion Workshop	2,000	- -	- -	- -	- -	- -
UV-B Workshop	5,000	- -	- -	- -	- -	- -
Animal and Plant Health Inspection Service:						
1890 Grantsmanship Workshop	3,500	- -	- -	- -	- -	- -
Biotechnology Exhibit	2,928	- -	- -	- -	- -	- -
Leafy Spurge Research	77,112	- -	48,600	- -	48,600	- -
Extension Service:						
Aquaculture Education Project	- -	- -	5,000	- -	- -	- -
Biotechnology Exhibit	2,928	- -	- -	- -	- -	- -
Science and Education Programs	50,000	- -	188,652	- -	188,652	- -
Office of Special Projects and Program Systems	20,997	- -	22,439	- -	22,439	- -
Food Science and Inspection Service:						
Biotechnology Workshop	16,200	- -	- -	- -	- -	- -
Calf Antibiotic Testing Project	27,000	- -	54,000	- -	50,000	- -
Meat and Poultry Research	37,800	- -	- -	- -	- -	- -
Salmonella Contamination Research	54,000	- -	- -	- -	- -	- -
Veterninary Products Info. System	- -	- -	60,000	- -	60,000	- -
Foreign Agricultural Service, International Trade Pilot Project	83,095	- -	83,095	- -	- -	- -
National Agricultural Library, Science and Education Programs	5,325	- -	7,465	- -	7,465	- -
Information Services	- -	- -	3,000	- -	3,000	- -
Office of International Cooperation and Development, 1890 Grantsmanship Workshop	1,100	- -	- -	- -	- -	- -
Rural Electrification Administration, Office of Agricultural Biotechnology	5,000	- -	- -	- -	- -	- -
Soil Conservation Service:						
Aquaculture Education Project	25,000	- -	- -	- -	- -	- -
Soil Erosion Workshop	8,000	- -	- -	- -	- -	- -
Various agencies sharing cost of USDA Small Business Innovation Research Program (SBIR)	279,150	- -	275,303	- -	275,088	- -

Item	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Various research agencies sharing cost of Current Research Information System (CRIS)	721,500	8	721,500	8	721,500	8
Miscellaneous Reimbursements	- -	- -	449,609	- -	641,919	- -
Total, Other USDA Appropriations	2,095,975	10	2,726,720	10	2,826,720	10
Total Agriculture Appropriations	343,012,975	167	388,312,720	175	352,569,720	193
Other Federal Funds:						
AID-PASA, Nitrogen fixation	242,064	- -	- -	- -	- -	- -
AID-PASA, International Research Centers	484,127	- -	484,127	- -	484,127	- -
Appalachian Regional Commission, Aquaculture Education Project	50,000	- -	- -	- -	- -	- -
Forest Service:						
1890 Grantsmanship Workshop	2,000	- -	- -	- -	- -	- -
Atmospheric deposition	78,972	- -	104,684	- -	104,684	- -
Biotechnology Exhibit	1,000	- -	- -	- -	- -	- -
UV-B Workshop	5,000	- -	- -	- -	- -	- -
Department of Commerce, NOAA, Atmospheric deposition	75,192	- -	72,240	- -	72,240	- -
Department of Defense:						
Effects of Aircraft Noise on Animals	200,000	- -	200,000	- -	200,000	- -
Computerized Environmental Resources Data System	240,000	- -	300,000	- -	200,000	- -
Guayule	766,560	- -	- -	- -	- -	- -
Department of Interior:						
Bureau of Land Management, Atmospheric deposition	81,360	- -	81,296	- -	81,296	- -
Geological Survey, Atmospheric deposition	488,535	- -	481,257	- -	481,257	- -
National Park Service, Atmospheric deposition	38,893	- -	23,000	- -	23,000	- -
Environmental Protection Agency, Atmospheric deposition	57,424	- -	26,676		26,676	
Food and Drug Administration, Veterninary Products Info. System	18,000	- -	45,000	- -	50,000	- -
National Institutes of Health, Air Contaminant Symposium	5.000	- -	- -	- -	- -	- -
Tennessee Valley Authority, Atmospheric deposition	15,808	- -	15,808	- -	15,808	- -
Total, Other Federal Funds	2,849,935	- -	1,773,280	- -	1,673,280	- -
Total, Cooperative State Research Service	345,862,910	167	390,086,000	175	354,243,000	193

	1989 Actual	1990 Estimated	1991 Estimated
Full-Time Equivalent Staff-Years:			
Ceiling	167	175	193
Non-ceiling	3	3	3
Total	170	178	196

COOPERATIVE STATE RESEARCH SERVICE

Permanent Positions by Grade and Staff-Year Summary

1989 and Estimated 1990 and 1991

Grade	1989 Headquarters	1990 Headquarters	1991 Headquarters
ES-6	1	1	1
ES-5	2	2	2
ES-4	1	1	1
ES-3	1	1	1
GS-16	1	1	1
GS/GM-15	26	34	34
GS/GM-14	13	15	19
GS/GM-13	8	13	13
GS-12	14	14	14
GS-11	5	5	9
GS-9	12	15	20
GS-8	4	5	5
GS-7	22	24	25
GS-6	25	25	25
GS-5	7	8	12
GS-4	11	11	11
GS-3	1	1	1
GS-2	4	4	4
Total Permanent Positions	158	180	198
Staff Years:			
Ceiling	167	175	193
Non-ceiling ...	3	3	3
Total	170	178	196

COOPERATIVE STATE RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1989 and Estimated 1990 and 1991

	1989	1990	1991
Personnel Compensation:			
Headquarters	$5,351,476	$5,834,000	$6,823,000
Field	- -	- -	- -
11 Total Personnel Compensation...........	5,351,476	5,834,000	6,823,000
12 Personnel Benefits	798,221	881,000	1,033,000
13 Benefits for former personnel	5,487	5,000	5,000
Total Pers. Comp. & Benefits .	6,155,184	6,720,000	7,861,000
Other Objects:			
21 Travel	854,439	921,000	1,074,000
22 Transportation of things	15,722	17,000	20,000
23.3 Communications, utilities & miscellaneous charges	414,336	431,000	494,000
24 Printing and reproduction.	180,993	194,000	208,000
25 Other services	4,722,292	5,193,689	2,477,979
26 Supplies and materials ...	184,621	192,000	218,000
31 Equipment	439,307	239,000	276,000
41 Grants, subsidies and contributions	334,076,878	372,798,311	337,114,021
Total other objects..........	340,888,588	379,986,000	341,882,000
Total direct obligations	347,043,772	386,706,000	349,743,000

Position Data:

	1989	1990	1991
Average Salary, ES positions .	$77,840	$80,640	$99,100
Average Salary, GM/GS positions	$36,744	$38,596	$37,001
Average Grade, GM/GS positions	9.42	9.76	9.74

COOPERATIVE STATE RESEARCH SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Cooperative State Research Service:

For payments to agricultural experiment stations, for cooperative forestry
and other research, for facilities, and for other expenses, including
[$157,045,000] $158,545,000 to carry into effect the provisions of the
Hatch Act approved March 2, 1887, as amended, including administration by
the United States Department of Agriculture, and penalty mail costs of
agricultural experiment stations under section 6 of the Hatch Act of 1887,
as amended, and payments under section 1361(c) of the Act of October 3,
1980 (7 U.S.C. 301n.); [$17,500,000] $12,975,000 for grants for cooperative
forestry research under the Act approved October 10, 1962 (16 U.S.C.
1 582a--582-a7), as amended [by Public Law 92-318 approved June 23, 1972],
including administrative expenses, and payments under section 1361(c) of
the Act of October 3, 1980 (7 U.S.C. 301n.); [$25,333,000] $26,169,000 for
payments to the 1890 land-grant colleges, including Tuskegee University,
for research under section 1445 of the National Agricultural Research,
Extension, and Teaching Policy Act of 1977 (Public Law 95-113), as amended,
including administration by the United States Department of Agriculture,
and penalty mail costs of the 1890 land-grant colleges, including Tuskegee
University; [$56,543,000] $25,597,000 for contracts and grants for
agricultural research under the Act of August 4, 1965, as amended (7 U.S.C.
450i); [$43,066,000] $100,000,000 for competitive research grants,
2 including administrative expenses; [$5,476,000 for the support of animal
health and disease programs authorized by section 1433 of Public Law
95-113, including administrative expenses; $325,000] $918,000 for
supplemental and alternative crops and products as authorized by the
National Agricultural Research, Extension, and Teaching Policy Act of 1977
3 (7 U.S.C. 3319d); [$5,368,000 for grants for research and construction of
facilities to conduct research pursuant to the Critical Agricultural
Materials Act of 1984 (7 U.S.C. 178); and section 1472 of the Food and
Agriculture Act of 1977, as amended (7 U.S.C. 3318), to remain available
until expended; $475,000 for rangeland research grants as authorized by
Subtitle M of the National Agricultural Research, Extension, and Teaching
Policy Act of 1977, as amended; $6,004,000] $6,000,000 for higher education
grants under section 1417(a) of Public Law 95-113, as amended (7 U.S.C.
4 3152(a)); [$3,750,000 for grants as authorized by section 1475 of the
National Agricultural Research, Extension, and Teaching Policy Act of 1977
and other Acts; $3,152,000 for grants to States for the operation of
international trade development centers, as authorized by the National
Agricultural Research, Extension, and Teaching Policy Act of 1977, as
amended (7 U.S.C. 3292);] $4,450,000 for low-input agriculture as
authorized by the National Agricultural Research, Extension, and Teaching
Policy Act of 1977 (7 U.S.C. 4701-4710); and [$13,507,000] $12,239,000 for
necessary expenses of Cooperative State Research Service activities,
including coordination and program leadership for higher education work of
the Department, administration of payments to State agricultural experiment
stations, funds for employment pursuant to the second sentence of section
5 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), of which $11,000,000
shall be for a program of capacity building grants to colleges eligible to
receive funds under the Act of August 30, 1890 (7 U.S.C. 321-326 and 328),
including Tuskegee University, and not to exceed $100,000 shall be for
employment under 5 U.S.C. 3109; in all, [$341,994,000] $346,893,000.

The first change deletes a reference to an amendment to the Act of October 10, 1962 (McIntire-Stennis Cooperative Forestry Research). This citation is not necessary.

The second change deletes language for animal health and disease research program authorized by section 1433 of Public Law 95-113.

The third change deletes language for research and construction authorized by the Critical Agricultural Materials Act of 1984 and for rangeland research grants as authorized by Subtitle M of Public Law 95-113. No funding is proposed for these programs in fiscal year 1991.

The fourth change deletes language for grants for the aquaculture centers as authorized by section 1475 of P.L. 95-113 and for grants for international trade development centers as authorized by section 1458A of P.L. 95-113. No funding is proposed for these programs in fiscal year 1991.

The fifth change provides language for the capacity building grants program at the 1890 land-grant institutions and Tuskegee University.

COOPERATIVE STATE RESEARCH SERVICE - CURRENT LAW

Appropriation Act, 1990	$341,994,000
Morrill-Nelson	2,850,000
Total, Appropriation Act, 1990	344,844,000
Budget Estimate, 1991	349,743,000
Increase in Appropriation	+4,899,000

Adjustments in 1990:		
Appropriation Act, 1990	$344,844,000	
Gramm-Rudman-Hollings Reduction (P.L. 99-177):		
Direct	-4,326,000	
Morrill-Nelson	-40,000	
Adjusted base for 1990		340,478,000
Budget estimate, 1991		349,743,000
Increase from adjusted 1990		+9,265,000

COOPERATIVE STATE RESEARCH SERVICE - PROPOSED LEGISLATION

Budget Estimate, Current Law, 1991	349,743,000
Change due to proposed legislation	-2,850,000
Net Request, President's 1991 Budget Request	346,893,000

SUMMARY OF INCREASES AND DECREASES - CURRENT LAW
(On basis of adjusted appropriation)

Item of Change	1990 Estimated	Pay Costs	Program Changes	1991 Estimated
Payments under the Hatch Act ..	$155,058,000	- -	+$3,487,000	$158,545,000
Cooperative forestry research .	17,279,000	- -	-4,304,000	12,975,000
Payments to 1890 colleges and Tuskegee University	25,012,000	- -	+1,157,000	26,169,000
Special research grants	73,127,000	- -	-42,162,000	30,965,000
Competitive research grants/ National Research Initiative.	42,521,000	- -	+57,479,000	100,000,000
Animal health and disease research, Section 1433	5,407,000	- -	-5,407,000	- -
Federal administration (direct appropriation)	13,336,000	+$139,000	-1,236,000	12,239,000
Higher education	8,738,000	- -	+112,000	8,850,000
Total Available	340,478,000	+139,000	+9,126,000	349,743,000

PROJECT STATEMENT - CURRENT LAW
(On basis of adjusted appropriation)

	1989 Actual		1990 Estimated			1991 Estimated	
Project	Amount	Staff Years	Amount	Staff Years	Increase or Decrease	Amount	Staff Years
1. Hatch Act							
Research program:							
Formula funds	$114,124,150		$114,591,308		+$2,510,640	$117,101,948	
Regional research.	36,172,313		36,050,563		+871,750	36,922,313	
Subtotal	150,296,463		150,641,871		+3,382,390	154,024,261	
Federal Admin. (3%)	4,410,309		4,416,129		+104,610	4,520,739	
Total	154,706,772	59	155,058,000	59	+3,487,000 (1)	158,545,000	69
2. Cooperative Forestry Research:							
Research program ..	16,975,000		16,760,630		-4,174,880	12,585,750	
Federal Admin. (3%)	525,000		518,370		-129,120	389,250	
Total	17,500,000	5	17,279,000	5	-4,304,000 (2)	12,975,000	5
3. Payments to 1890 Colleges & Tuskegee University:							
Research program ..	23,603,010		24,261,640		+1,122,290	25,383,930	
Federal Admin. (3%)	729,990		750,360		+34,710	785,070	
Total	24,333,000	8	25,012,000	8	+1,157,000 (3)	26,169,000	8
4. Special Research Grants:							
Acid precipitation .	661,000		653,000		-653,000	- -	
Aflatoxin research, Illinois	- -		87,000		-87,000	- -	
Agricultural diversification, Hawaii ..	156,000		154,000		-154,000		
Agricultural trade, North Dakota	600,000		592,000		-592,000	- -	
Agricultural utilization, Minnesota ...	200,000		395,000		-395,000	- -	
Alternative cropping systems in the Southeast, S.Carolina	285,000		281,000		-281,000	- -	
Alternative crops, North Dakota	- -		494,000		-494,000	- -	
Alternative pest control, Arkansas .	1,400,000		1,382,000		-1,382,000	- -	
Alternative to Dinoseb, Oregon ...	150,000		222,000		-222,000	- -	
Animal health research	5,705,000		5,633,000		-5,633,000	- -	
Animal Science Food Safety Consortium .	1,400,000		1,678,000		-1,678,000	- -	
Apple quality research, Michigan ..	95,000		94,000		-94,000	- -	
Aquaculture research (general)	520,000		563,000		-563,000	- -	
Aquaculture, Stoneville, Mississippi.	588,000		581,000		-581,000	- -	
Asparagus yield decline, Michigan .	95,000		94,000		-94,000	- -	
Bean and beet research, Michigan ..	190,000		188,000		-188,000	- -	
Belgian endive, Mass.	60,000		59,000		-59,000	- -	
Blueberry shoestring virus, Michigan ...	92,000		91,000		-91,000	- -	
Broom snakeweed, New Mexico	100,000		148,000		-148,000	- -	

Project	1989 Actual		1990 Estimated		Increase or Decrease	1991 Estimated	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
Celery fusarium, Michigan	$40,000		$39,000		-$39,000	- -	
Chesapeake Bay aquaculture, Maryland	- -		370,000		-370,000		
Cranberry/blueberry disease & breeding, New Jersey	260,000		257,000		-257,000	- -	
Dairy & beef photoperiod, Michigan	33,000		33,000		-33,000	- -	
Dairy goat research, Prairie View A&M, Texas	- -		74,000		-74,000	- -	
Dark-end syndrome of potatoes	150,000		49,000		-49,000	- -	
Delta rural revitalization, Mississippi	175,000		173,000		-173,000	- -	
Dried bean research, North Dakota	75,000		87,000		-87,000	- -	
EDB replacement, Hawaii	285,000		- -		- -	- -	
Expanded wheat pasture, Oklahoma	400,000		148,000		-148,000	- -	
Export Services, Oregon	- -		247,000		-247,000		
Floriculture, Hawaii	300,000		296,000		-296,000	- -	
Food & Agriculture Policy Institute, Iowa & Missouri	463,000		714,000		-714,000	- -	
Food Marketing Policy Center, Connecticut	285,000		373,000		-373,000	- -	
Food processing, Mississippi	173,000		- -		- -	- -	
Food systems group, Wisconsin	148,000		219,000		-219,000	- -	
Global Change	- -		- -		+5,000,000	$5,000,000	
Grasshopper biocontrol, North Dakota	69,000		71,000		-71,000	- -	
Human nutrition, New York	450,000		556,000		-556,000	- -	
Integrated orchard management, Vermont	- -		49,000		-49,000		
Integrated pest management	2,940,000		2,903,000		+1,097,000	4,000,000	
Integrated production systems, Oklahoma	188,000		186,000		-186,000	- -	
Integrated reproduction management, Nebraska	75,000		- -		- -	- -	
International livestock program, Kansas	95,000		94,000		-94,000	- -	
Iowa Biotechnology Consortium	1,225,000		1,593,000		-1,593,000	- -	
Livestock & dairy policy, New York & Texas	450,000		518,000		-518,000	- -	
Lowbush blueberry research, Maine	- -		170,000		-170,000		
Low-input agric., Minnesota	100,000		148,000		-148,000	- -	
Maple research, Vermont	100,000		99,000		-99,000	- -	
Michigan Biotechnology Institute	1,750,000		2,160,000		-2,160,000	- -	
Midwest Biotechnology Consortium	1,750,000		2,592,000		-2,592,000	- -	

Project	1989 Actual		1990 Estimated		Increase or Decrease	1991 Estimated	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
Milk consumption, Pennsylvania	$285,000		$281,000		-$281,000	- -	
Milkweed research, Nebraska	68,000		79,000		-79,000	- -	
Minor crop pest control, Hawaii ...	- -		281,000		-281,000		
Minor use animal drugs	229,000		226,000		+103,000	$329,000	
Mosquito research, riceland agro-ecosystem	456,000		450,000		-450,000	- -	
Multi-cropping strategies for aquaculture, Hawaii ...	152,000		150,000		-150,000	- -	
National Biological Impact Assessment Program	125,000		123,000		+177,000	300,000	
New uses for agricultural products, Ohio	133,000		131,000		-131,000	- -	
Nonfood agricultural products, Nebraska.	- -		109,000		-109,000		
Oil from jojoba, New Mexico	- -		148,000		-148,000		
Operation small farm, Louisiana	- -		99,000		-99,000		
Oregon/Massachusetts biotechnology	- -		247,000		-247,000		
Peach tree short life, South Carolina	192,000		190,000		-190,000	- -	
Pesticide clearance.	1,369,000		1,975,000		+1,025,000	3,000,000	
Pesticide impact assessment	2,218,000		2,437,000		+531,000	2,968,000	
Pesticide research, Washington	- -		49,000		-49,000	- -	
Plastic from cornstarch, Nebraska ..	40,000		39,000		-39,000	- -	
Potato research	1,177,000		1,310,000		-1,310,000	- -	
Preservation and processing, Oklahoma .	267,000		264,000		-264,000	- -	
Prime farmland reclamation, Illinois & Kentucky	450,000		543,000		-543,000	- -	
Regional barley gene mapping project ...	- -		153,000		-153,000		
Regionalized implications of farm programs	- -		346,000		-346,000		
Rural development centers	500,000		494,000		-494,000	- -	
Rural economic development, Georgia ...	- -		739,000		-739,000		
Russian wheat aphid.	100,000		346,000		-346,000	- -	
Safflower research, N. Dakota & Montana	- -		247,000		-247,000	- -	
Sandhills grazing management practices Nebraska	100,000		99,000		-99,000	- -	
Satellite assessment of drought, Oklahoma	300,000		- -		- -	- -	
Seafood harvesting, processing, marketing, Mississippi ..	- -		368,000		-368,000	- -	
Seedstocks enhancement, North Dakota.	200,000		197,000		-197,000	- -	
Soil erosion in Pacific Northwest .	591,000		584,000		-584,000	- -	

Project	1989 Actual		1990 Estimated		Increase or Decrease	1991 Estimated	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
Southwest Consortium for plant genetics & water resources ...	$385,000		$380,000		-$380,000	- -	
Soybean cyst nematode, Missouri	285,000		281,000		-281,000	- -	
Stone fruit decline, Michigan	285,000		281,000		-281,000	- -	
Stored grain insects, Kansas	285,000		281,000		-281,000	- -	
Subirrigation research, Michigan ..	- -		62,000		-62,000	- -	
Sunflower insects, North Dakota and South Dakota	190,000		188,000		-188,000	- -	
TCK smut (wheat) ...	193,000		247,000		-247,000	- -	
Tropical & subtropical research .	3,341,000		3,299,000		-3,299,000	- -	
Water management, Alabama	300,000		395,000		-395,000	- -	
Water quality	- -		6,615,000		+3,385,000	$10,000,000	
Wheat genetics, Kansas	100,000		99,000		-99,000	- -	
Wood utilization ...	2,852,000		2,816,000		-2,816,000	- -	
Wool research, Texas	142,000		144,000		-144,000	- -	
World food systems, Indiana and Ohio ..	300,000		355,000		-355,000	- -	
Youth science camp, West Virginia	- -		74,000		-74,000	- -	
Federal Admin. (4%).	(1,675,440)		(2,233,120)		(-1,209,240)	(1,023,880)	
Total	41,886,000		55,828,000		-30,231,000	25,597,000	
Critical Agricultural Materials Act of 1984							
Research and construction program.	3,557,960		5,141,000		-5,141,000	- -	
Federal Admin. (3%)	110,040		159,000		-159,000	- -	
Total	3,668,000		5,300,000		-5,300,000	- -	
Rangeland Research Grants (Subtitle M):							
Research program ..	460,750		454,930		-454,930	- -	
Federal Admin. (3%)	14,250		14,070		-14,070	- -	
Total	475,000		469,000		-469,000	- -	
Aquaculture Centers, Section 1475:							
Research program ..	3,637,500		3,591,910		-3,591,910	- -	
Federal Admin. (3%)	112,500		111,090		-111,090	- -	
Total	3,750,000		3,703,000		-3,703,000	- -	
International Trade Centers, Sec. 1458A:							
Program	3,057,440		3,018,640		-3,018,640	- -	
Federal Admin. (3%)	94,560		93,360		-93,360	- -	
Total	3,152,000		3,112,000		-3,112,000	- -	
Other Agreements, Section 1472:							
Program	266,750		- -		- -	- -	
Federal Admin. (3%)	8,250		- -		- -	- -	
Total	275,000		- -		- -	- -	
Low Input/Sustainable Agric. Prog. (LISA)							
Program	4,316,500		4,262,180		+54,320	4,316,500	
Federal Admin. (3%)	133,500		131,820		+1,680	133,500	
Total	4,450,000		4,394,000		+56,000	4,450,000	

Project	1989 Actual		1990 Estimated		Increase or Decrease	1991 Estimated	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
Supplemental and Alternative Crops, Sec. 1473D:							
Oilseed, N. Dakota.	$500,000		- -		- -	- -	
Crambe/Rapeseed ...	325,000		$321,000		-$71,000	$250,000	
Mesquite research, Texas	100,000		- -		- -	- -	
Oil from jojoba, NM	100,000		- -		- -	- -	
Guayule research ..	- -		- -		+668,000	668,000	
Federal Admin. (3%)	(30,750)		(9,630)		(+17,910)	(27,540)	
Total	1,025,000		321,000		+597,000	918,000	
Groundwater Quality:							
Program	2,910,000		- -		- -	- -	
Federal Admin. (3%)	90,000		- -		- -	- -	
Total	3,000,000		- -		- -	- -	
	61,681,000	26	73,127,000	26	-42,162,000 (4)	30,965,000	26
5.Competitive Research Grants/National Research Initiative (NRI)							
Plant science	8,000,000		7,751,000		-7,751,000	- - (a)	
Soybean research ..	(493,000)		(487,000)		(-487,000)	- - (a)	
Alcohol fuels	(514,000)		(507,000)		(-507,000)	- - (a)	
Human nutrition	1,000,000		1,481,000		-1,481,000	- - (a)	
Animal science......	6,000,000		4,937,000		-4,937,000	- - (a)	
Brucellosis	(475,000)		(469,000)		(-469,000)	- - (a)	
Pest science	2,000,000		1,975,000		-1,975,000	- - (a)	
Biotechnology (animal & plant) ..	19,016,000		18,775,000		-18,775,000	- - (a)	
Stratospheric ozone.	3,700,000		3,653,000		-3,653,000	- - (a)	
Forestry	- -		3,949,000		-3,949,000	- - (a)	
NRI-Natural Resources and Environment ...	- -		- -		+15,000,000	15,000,000	
NRI-Nutrition, Food Quality, & Health .	- -		- -		+5,000,000	5,000,000	
NRI-Plant Systems ..	- -		- -		+50,000,000	50,000,000	
NRI-Animal Systems .	- -		- -		+30,000,000	30,000,000	
Federal Admin. (4%).	(1,588,640)		(1,700,840)		(+2,299,160)	(4,000,000)	
Total	39,716,000	38	42,521,000	41	+57,479,000 (5)	100,000,000	60
6.Animal Health and Disease Research, Section 1433:							
Research program ...	5,256,960		5,190,720		-5,190,720	- -	
Federal Admin. (4%).	219,040		216,280		-216,280	- -	
Total	5,476,000	2	5,407,000	2	-5,407,000 (6)	- -	- -
7.Federal Administration (Direct App.)(b):							
Gulf Coast shrimp aquaculture	2,736,000		3,195,000		-3,195,000	- -	
Mississippi Valley State University ..	625,000		617,000		-617,000	- -	
Iowa State-Center for Food & Industrial Ag. Product Dev. ..	950,000		- -		- -	- -	
Pay Costs and Federal Employee Retirement System .	250,000		- -		- -	- -	
Pay Costs	- -		- -		+139,000	139,000	
Iowa State-Center for Ag. & Rural Dev. ..	750,000		741,000		-741,000	- -	
Geographic Information System Pilot Program	- -		$494,000		-$494,000	- -	

Project	1989 Actual Amount	1989 Actual Staff Years	1990 Estimated Amount	1990 Estimated Staff Years	Increase or Decrease	1991 Estimated Amount	1991 Estimated Staff Years
Water Quality, Ill., Iowa, & North Dakota	- -		1,687,000		-1,687,000	- -	
Office of Grants and Program Systems ...	$529,000		568,000		-568,000	- -	
Office of Agricultural Biotechnology	250,000		222,000		+278,000	$500,000	
Ag in the Classroom.	87,000		135,000		+65,000	200,000	
Peer Panels	200,000		247,000		+153,000	400,000	
1890 Capacity Building Grants ...	- -		5,430,000		+5,570,000	11,000,000	
Total	6,377,000	6	13,336,000	8	-1,097,000 (7)	12,239,000	8
8. Higher Education:							
Graduate Training Grants	2,852,000		2,816,000		+1,184,000	4,000,000	
Institution Challenge Grants	- -		987,000		+1,013,000	2,000,000	
Strengthening Grants 1890 Colleges	1,902,000		1,878,000		-1,878,000	- -	
Morrill-Nelson Funds (Permanent Appro.).	2,850,000		2,810,000		+40,000	2,850,000	
Vocational Agriculture Curriculum, Aquaculture	- -		247,000		-247,000	- -	
Federal Admin. (3%)	(142,620)		(177,840)		(-27,840)	(150,000)	
Total	7,604,000	5	8,738,000	6	+112,000 (8)	8,850,000	7
Total obligations	317,393,772	149	340,478,000	155	+9,265,000	349,743,000	183
Unobligated Balances:							
Lapsing	838,228	- -	- -	- - -	- -	- -	- -
Transferred	-275,000	- -	- -	- - -	- -	- -	- -
Total available or estimate	317,957,000	149	340,478,000	155	+9,265,000	349,743,000	183
Gramm-Rudman-Hollings Reduction, P. L. 99-177	- -	- -	4,366,000	- -			
Total, Appropriation ..	317,957,000	149	344,844,000	155			

(a) Incorporated within the National Initiative for Research on Agriculture, Food and the Environment.

(b) The amounts listed in this table do not include all the costs associated with the items within the Direct Federal Administration activity. The amounts listed below are the additional costs that are funded for these purposes from the administrative set-aside of program funds.

Project	1989 Actual	1990 Estimated	1991 Estimated
Ag in the Classroom ...	$92,000	$50,000	- -
Office of Agricultural Biotechnology	140,547	247,000	- -
Peer Panels	248,224	248,478	$255,770
Office of Grants and Program Systems	3,508,678	4,124,614	5,234,309
Other, Federal Administration	3,989,449	4,670,092	5,490,079

EXPLANATION OF PROGRAM

The funds appropriated for the Cooperative State Research Service (CSRS) provide the Federal Government's support for land-grant agricultural experiment stations, approved schools of forestry, the 1890 land-grant institutions and Tuskegee University, colleges of veterinary medicine, and other eligible institutions in the fifty States and in Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, Micronesia, and the Northern Mariana Islands.

The State institutions conduct research and experiments on the problems continuously encountered in the development of a permanent and sustaining agriculture and forestry, and in the improvement of the economic and social welfare of rural and urban families. Because of differences in climate, soil, market outlets, and other local conditions, each State has distinct problems in the production and marketing of crops and livestock. Farmers, foresters, and rural people in the individual States naturally look to their State Agricultural Experiment Stations, universities, and colleges for solution of the State and local problems and request services to help meet changing conditions.

Research programs at State institutions, to be most effective, include participation in regional and national programs. Joint effort by a group of State institutions is the most effective and often the only practical approach to problems of common interest. The stations are acting together as regional groups to provide cooperative, coordinated attacks on problems of regional and national interest. In a similar manner, the research programs of the State institutions and the Department of Agriculture are complementary and interdependent.

The Federal formula funds constitute a powerful force in bringing about inter-State cooperation and Federal-State collaboration in the planning and conduct of this overall program of agricultural research. Therefore, the impact of the Federal formula funds is far greater than would be expected solely on the basis of the amount of funds provided.

Research at the State institutions is organized into a program of projects that is submitted for approval by the Cooperative State Research Service. The program of projects is financed wholly or in part from Federal formula and grant funds. Programs and projects are evaluated periodically with station scientists by administrators and scientific staff of the Cooperative State Research Service. The evaluation includes consideration of quality and productivity of the program and projects. The continuing process of research evaluation by station scientists and the staff of the Cooperative State Research Service results in a dynamic program with approximately 15 to 20 percent of the projects being replaced by new and/or revised projects each year.

Appropriations for the Cooperative State Research Service activities are authorized under the following Acts:

1. Payments to agricultural experiment stations under the Hatch Act
   Agricultural Experiment Stations Act of August 11, 1955, Hatch Act of 1887 as amended - 7 U.S.C. 361a-361i, Public Law 92-318; Public Law 93-471; Public Law 95-113, as amended; Public Law 95-134; Public Law 96-205; Public Law 96-374; Public Law 96-597; Public Law 97-98; Public Law 98-213; Public Law 98-454; Public Law 99-198; Public Law 99-396.

   Funds under the Hatch Act are allocated to the State Agricultural Experiment Stations of the 50 States, District of Columbia, Puerto Rico, Guam, the Virgin Islands, Micronesia, American Samoa, and Northern Mariana Islands for research to promote a sound and prosperous agriculture and rural life. The Hatch Act provides that the distribution of Federal payments to States for fiscal year 1955 shall become a fixed base and that any sums appropriated in excess of the 1955 level shall be distributed in the following manner:

-20% shall be allotted equally to each State.
-not less than 52% shall be allotted to the States as follows:
  one-half in an amount proportionate to the relative rural population of each State to the total rural population of all States, and
  one-half in an amount proportionate to the relative farm population of each State to the total farm population of all States.
-not more than 25% shall be allotted to the States for cooperative research in which two or more State Agricultural Experiment Stations are cooperating to solve problems that concern the agriculture of more than one State.
-3% shall be available to the Secretary of Agriculture for the administration of this Act.

The Act also provides that any amount in excess of $90,000 available for allotment to any State, exclusive of the regional research fund, shall be matched by the State out of its own funds available for research, and for the establishment and maintenance of facilities necessary for the performance of such research. Also, in the case of Guam, the Virgin Islands, Micronesia, American Samoa, and Northern Mariana Islands, agencies are required by law to waive any requirement for local matching funds under $200,000.

Three percent of funds appropriated under the Hatch Act is set-aside for Federal administration. Administration includes disbursement of funds and a continuous review and evaluation of the research programs of the State Agricultural Experiment Stations supported wholly or in part from Hatch funds. The Cooperative State Research Service encourages and assists in the establishment of cooperation within and between the States, and also actively participates in the planning and coordination of research programs between the States and the Department at the regional and national levels.

2. Cooperative Forestry Research - The Cooperative Forestry Research Act of October 10, 1962, 16 U.S.C. 582a-7; Public Law 96-374; Public Law 97-98; Public Law 99-198.

   The Act authorizes funding of research in State institutions certified by a State representative designated by the governor of each State. The Act provides that appropriated funds be apportioned among States as determined by the Secretary after consultation with a national advisory council of not fewer than sixteen members representing Federal and State agencies concerned with developing and utilizing the Nation's forest resources, the forest industries, the forestry schools of the State-certified eligible institutions, State Agricultural Experiment Stations, and volunteer public groups concerned with forests and related natural resources. Determination of apportionments follows consideration of pertinent factors including areas of non-Federal commercial forest land, volume of timber cut from growing stock, and the non-Federal dollars expended on forestry research in the State. The Act also provides that payments must be matched by funds made available and budgeted from non-Federal sources by the certified institutions for expenditure for forestry research. Three percent of funds appropriated under this Act is set-aside for Federal administration.

3. Payments to 1890 Colleges and Tuskegee University - The National, Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1445, Public Law 95-113; Public Law 95-547; Public Law 97-98; Public Law 99-198.

   Public law 95-113, as amended provides for support of continuing agricultural research at colleges eligible to receive funds under the Act of August 30, 1890, including Tuskegee University. Beginning with fiscal year 1979, there shall be appropriated funds for each fiscal year, an amount not less than 15% of the total for such year under Section 3 of the Act of March 2, 1887. Distribution of payments made available under section 2 of the Act of August 4, 1965, for fiscal year 1978 are a fixed base and sums in excess of the 1978 level shall be distributed as follows:

- -3% shall be available to the Secretary of Agriculture.
- -Payments to States in fiscal year 1978 is a fixed base. Of funds in excess of this amount:
  - 20% shall be allotted equally to each State.
  - 40% shall be allotted in an amount proportionate to the rural population of the State in which the eligible institution is located to the total rural population of all the States in which eligible institutions are located, and
  - 40% shall be allotted in an amount proportionate to the farm population of the State in which the eligible institution is located to the total farm population of all the States in which eligible institutions are located.

Allotments to Tuskegee University and Alabama A&M University shall be determined as if each institution were in a separate State. Three percent of the funds appropriated under this Act is set-aside for Federal administration. This includes disbursements of funds and review and evaluation of research projects.

4. Special Research Grants- Section 2(c), Act of August 4, 1965, 7 U.S.C. 450i as amended by Public Law 95-113; Public Law 97-98; Public Law 98-284; Public Law 99-198.

Section 2 of the Act of August 4, 1965, as amended, authorizes Special Research Grants for periods not to exceed five years to land-grant colleges and universities, research foundations established by land-grant colleges and universities, State Agricultural Experiment Stations, and to all colleges and universities having a demonstrable capacity in food and agriculture research, to carry out research to facilitate or expand promising breakthroughs in areas of the food and agricultural sciences of importance to the Nation; and to State Agricultural Experiment Stations, land-grant colleges and universities, research foundations established by land-grant colleges and universities, colleges and universities receiving funds under the Act of October 10, 1962, and accredited schools or colleges of veterinary medicine, to facilitate or expand ongoing State-Federal food and agricultural research. Special Research Grants are awarded on the discretionary basis as well as using a competitive peer panel process in the selection of proposals to be funded.

Research grants are also awarded under the Critical Agricultural Materials Act, Public Law 98-284, as amended. Rangeland Research Grants are awarded in accordance with Subtitle M of Public Law 97-98. Grants are awarded to aquaculture centers under section 1475(d) of Public Law 95-113, as amended. Other research grants are awarded under section 1472 of Public Law 95-113, as amended. Grants for international trade development centers are awarded under section 1458A of Public Law 95-113. Grants for supplemental and alternative crops are awarded under section 1473D of Public Law 95-113. Low-input agricultural productivity research grants are awarded under Subtitle C of Public Law 99-198.

5. Competitive Research Grants/National Research Initiative - Section 2(b), Act of August 4, 1965, 7 U.S.C. 450i, as amended by Public Law 95-113; Public Law 97-98; Public Law 99-198.

Section 2 of the Act of August 4, 1965, as amended authorizes Competitive Research Grants for periods not to exceed five years to State Agricultural Experiment stations, all colleges and universities, other research institutions and organizations, Federal agencies, private organizations or corporations, and individuals to further the programs of the Department of Agriculture. By obtaining the participation of outstanding researchers in the entire U.S. scientific community, emphasis will be placed on research in the areas of natural resources and the environment; nutrition, food quality, and health; plant systems; and animal systems.

6. Animal Health and Disease Research - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1433, Public Law 95-113; Public Law 97-98; Public Law 99-198.

Section 1433 provides for support of livestock and poultry disease research in accredited schools or colleges of veterinary medicine or State Agricultural Experiment Stations that conduct animal health and disease research. These funds shall be distributed as follows:

-4% shall be retained by the Department of Agriculture for administration, program assistance to the eligible institutions, and program coordination.
-48% shall be distributed in an amount proportionate to the value of and income to producers from domestic livestock and poultry in each State to the total value of and income to producers from domestic livestock and poultry in all the States.
-48% shall be distributed in an amount proportionate to the animal health research capacity of the eligible institutions in each State to the total animal health research capacity in all the States.

Eligible institutions must provide non-Federal matching funds in States receiving annual amounts in excess of $100,000 under this authorization.

7. Federal Administration (direct appropriation) - Authority for direct appropriations is provided in the annual Agriculture, Rural Development, and Related Agencies Appropriations Act. These funds are used to provide support services in connection with research planning and coordination of all programs administered by Cooperative State Research Service. Certain research and higher education program grants are also funded under this item.

8. Higher Education - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1417, Public Law 95-113; Public Law 97-98; Public Law 99-198; Second Morrill Act of 1890; Public Law 100-339.

Higher Education-Strengthening Grants pursuant to Section 1417(a)(2)(A) support resident instruction programs at historically black land-grant institutions and Tuskegee University. Higher Education-Graduate Training Grants pursuant to Section 1417(a)(3)(B) are awarded on a competitive basis to colleges and universities to conduct graduate training programs to stimulate the development of food and agricultural scientific expertise in targeted national need areas. Institution Challenge Grants pursuant to Section 1417 (a)(2)(A) are designed to stimulate and enable colleges and universities to provide the quality of education necessary to produce graduates capable of strengthening the Nation's food and agricultural scientific and professional workforce. Higher education in the food and agricultural sciences at the land-grant institutions is also supported through a permanent appropriation in the Second Morrill Act of 1890, as amended.

OIG Reports

#13004-13-At 9/8/89 Audit of the Cooperative Research Program at Tuskegee University.
#13601-01-At 3/31/89 Audit of the Research Facilities Program at 1890 Land Grant Institutions and Tuskegee University.
#13099-5-At 10/31/88 Cooperative State Research Service Corrective Action on an Office of Management and Budget Circular A-110 Audit, Alabama Agriculture and Mechanical University, Normal, Alabama.

JUSTIFICATION OF INCREASES AND DECREASES

(1) An increase of $3,487,000 for payments to States under the formula provisions of the Hatch Act program ($155,058,000 available in 1990).

Need for Change. The State-Federal partnership that resulted from the passage of the Hatch Act in 1887 has fostered a network of communication and collaboration that has led to a functional National Cooperative Agricultural Research System. The uniqueness of this system is its ability to meet the national, regional and local needs of the American farmer, consumer and rural community. Funds from the Hatch Act are distributed on a formula basis to the State Agricultural Experiment Stations (SAES) of the 50 States, District of Columbia, Puerto Rico, Guam, the Virgin Islands, Micronesia, American Samoa and the Northern Mariana Islands for research to promote a sound and prosperous agriculture and rural life. Funds are also distributed from a Regional Research Fund to approved national and regional projects to encourage inter-institutional collaboration on problems of national and regional significance.

An additional positive effect of the Hatch Act on the funding of agricultural research is that many States exceed the minimum matching requirement so that the Hatch Act serves as a resource multiplier. At the present time the ratio of Hatch Act funds to State appropriated funds is 1:4, a uniquely successful demonstration of the extended impact of Federal funds.

Hatch Act funding, and the entrained State funds, have formed a stable base of funding for agricultural research that has served as a seedbed for the germination of new ideas. A long term stable funding base has permitted scientists in the State Agricultural Experiment Stations to be persistent in the search for creative solutions. Ideas that have emerged from this stable system have been expanded and elaborated by funds from other programs, such as the CSRS Special and Competitive Research Grants.

Agriculture continues to face a short-term survival crisis and a long-term need for new technology that will restore competitiveness in both the domestic and international marketplace and enhance profitability. The continuing awareness of the necessity of a pollution free technology that enhances our natural and renewable resources, preserves environmental quality and still permits the production of food and fiber at the lowest possible cost is a challenging objective in our research agenda.

The specific agenda is broad and complex. It includes: sustaining soil productivity, maintaining and protecting water quality and quantity, improved multi-use management of rangelands and pastures, determining the effects of atmospheric deposition and global change, increasing the biological efficiency of animals, reducing disease losses in animals, genetically improving crop plants, improving the management of crop pests and diseases, enhancing the economics of agriculture, improving performance and profitability through agricultural policy changes, improving the efficiency of marketing agricultural products, enhancing the rural family and community well-being, improving our understanding of nutrition and the health status of people, improving our understanding of molecular and cellular processes, improving our use of computer technology for agricultural management, advancing the use of robotics in agriculture, and enhancing the quality of processed food.

Although the agenda is demanding, the opportunities for achieving our objective through research are great. The track record of Hatch Act supported research is well documented and the annual return of near 50 percent on the invested research dollar encourages us to be optimistic. Coupled with the achievements of the past are the creative ambitions of approximately 12,500 scientists in 59 institutions who are dedicated to the solution of problems of agriculture through science.

Nature of Change. These funds are needed to assist the State Agricultural Experiment Stations in maintaining strong base programs across a broad spectrum of high priority research areas. The research conducted by the SAES has been complementary, and cooperative with, that performed by Federal researchers in contributing to the high level and efficiency of food and fiber production. The effectiveness of research is enhanced by comprehensive knowledge of the characteristics of the production area and close interaction among the researchers and the research users. These funds will provide the State Agricultural Experiment Stations with continued flexibility needed to address high priority local, regional, and national food and agricultural research issues.

(2) A decrease of $4,304,000 for payments to States under the formula provisions of the Cooperative Forestry Research program ($17,279,000 available in 1990).

Need for Change. The Cooperative Forestry (McIntire-Stennis) Research program at land-grant and other State institutions is planned and directed to provide answers to questions that face forest and land owners and managers seeking to produce an adequate domestic timber supply with a diminishing land base while accommodating recreational, sport, esthetic, and environmental demands on the same land. State research institutions conduct forestry research under other authorizations which provide opportunity to respond to State, regional, and national priorities as appropriate. A portion of this program is proposed for elimination, however, the State Agricultural Experiment Stations and Forestry Schools have maximum flexibility under this program to tailor research according to specific needs and can continue to fund research in those areas that they identify as highest priority.

Nature of Change. Program objectives in the sixty-two participating institutions will be conducted at a reduced level. Ongoing Federal and State forestry research efforts will also continue under other authorizations. In addition, funds for forestry research will be available on a competitive basis through the National Research Initiative.

(3) An increase of $1,157,000 for payments to the 1890 Land-Grant Colleges and Tuskegee University under the formula provisions of the Evans-Allen program ($25,012,000 available in 1990).

Need for Change. As part of the Department's initiative for 1890 land-grant institutions and Tuskegee University to develop their institutional capacity, research and technology development must increase to insure returns to society. Small-scale and alternative agriculture is essential for its contribution to the vitality and the quality of life in rural America, if not for its contribution to aggregate agricultural production. Statistics clearly indicate that the number of small-scale farmers is increasing rather than decreasing. It is estimated that by the year 2000, 80 percent of the American farming population will be considered small-scale producers. Furthermore, most of these farmers will operate on a part-time basis; nevertheless, it is these farmers who will contribute significantly to both the social and economic base for rural America. Many of the 1890 institutions have unique strengths in the area of small-scale agriculture. Following a five-year program of facility modernization, these institutions have the capacity to fulfill an expanded role in research and training.

Nature of Change. Increased funding will be used to provide greater emphasis to alternative cropping systems and management systems for animals such as goats (meat and milk types) and rabbits. These animals can be produced by small-scale agricultural operations with relatively small capital investment and financial risk. Experiments will be conducted on crops that are adapted to, but not normally grown in, some areas. While production systems are being evaluated, concurrent studies on marketing opportunities and strategies will be undertaken. Experiments will provide baseline data for commercializing these alternative crops. Studies in goat production will range from management and nutrition studies with forages and alternative foodstuffs, to the use of gene transfer to improve production and protection through genetics.

Increased emphasis on the identification of new employment opportunities will be explored with special emphasis on off-farm employment, home based businesses, expansion of the rural service sector, and other economic diversity for family income stability and rural community growth. Resource management research will be undertaken to improve the family and community skills in managing money, time, and human and physical resources. Research is needed to develop alternative marketing systems and management strategies for small-scale agriculture and to determine the economic feasibility of nontraditional crops and animal enterprises.

Increased emphasis will also be on aquaculture, as an alternative crop to diversify farm production. Aquaculture production nationwide is estimated at more that 700 million pounds with a farm market value at more than $500 million. The market outlook for aquaculture products is generally excellent. Wild harvest on a global scale has leveled off and U.S. per capita consumption of seafood products has increased steadily over the last decade. New technologies in fish and shellfish culture, as well as increasing costs in the traditional fish harvesting sector, have made aquaculture production very competitive with wild harvest. Studies on water quality, physiology and diseases will be among the important research areas.

(4) A net decrease of $42,162,000 for Special Research Grants, Critical Agricultural Materials Act, Rangeland Research Grants, Aquaculture Centers, and International Trade Development Centers ($73,127,000 available in 1990) consisting of:

(a) An increase of $5,000,000 for Global Change Special Research Grants (No funding available in 1990).

Need for Change. Global Change studies were identified in a government-wide crosscut analysis which led to a comprehensive planning effort across agencies and a commitment to a coordinated program of research. The USDA, including CSRS, has an important role to play in this activity. The USDA plan draws on CSRS for the capability of the State Agricultural Experiment Station and forestry research system to employ its unique competencies and broad geographic locations. The proposed funding of $5 million will support research as identified in this joint planning process. Increased research is needed on the problem of increasing amounts of the so called greenhouse gases from agriculture. Carbon dioxide and methane are two of the most important of these. There has been a significant amount of research involving carbon dioxide, but methane remains to be researched thoroughly. Agriculture is an important source of methane generation from rice production, animal wastes, ruminant animals digestive processes, and wetlands.

The concentration of methane in the atmosphere is currently increasing at a rate of approximately one percent per year. Continued increases in the concentration of methane in the atmosphere will lead to greater tropospheric ozone formation (a component of smog) which is considered a threat to human health and the environment. In addition, increasing methane concentrations directly and indirectly change radiative properties of the atmosphere, contributing to the greenhouse effect. Current estimates indicate that anthropogenic sources account for about 60 percent of methane emissions with the remaining emissions, from natural sources, associated with swamps, marshes, lakes and oceans. Animals, and in particular managed ruminant animals, produce significant quantities of methane as part of their digestive processes. Excluding animal wastes, ruminants are estimated to account for nearly one fourth of the total anthropogenic emissions, or about 15 percent of total emissions. While many uncertainties exist, it would appear that with adequate resources and policies, emissions of methane from livestock could be reduced from 25 percent to 75 percent. Reductions in methane probably would contribute to higher animal productivity.

The burning of fossil fuels has been identified as a major factor in the increasing concentration of carbon dioxide. Reducing the amount of energy required (conservation) and the substitution of biomass energy sources, such as alcohol and vegetable oils, in the U.S. food and agriculture system could significantly reduce carbon dioxide production. Opportunities to achieve these goals are by continued research on alcohol fuels and the successful development and utilization of the external combustion engine technology. The external combustion engine can utilize a broad range of energy sources including biologically-based carbon fuels, and results in cleaner by-products of combustion. There is a need to develop and evaluate mobile and stationary power systems for small-scale power demands such as irrigation pump systems utilizing external combustion engines. The engine should be tested for use in generating electric power when fueled with energy produced from agricultural products and agriculture and forestry by-products.

Global change is occurring with many reports of decreasing ozone levels which would lead to increasing levels of UV-B radiation that can damage plants. However, little information exists on the overall aspects of this potentially serious problem. UV-B studies are needed on basic plant biology (already started with competitive research grants); what are the UV-B levels found in U.S. agricultural areas and how rapidly are these levels changing; and the growth and yield responses of economic crops and trees to changing levels of UV-B radiation.

Acidic precipitation continues to be important because little is known of its linkages with global climate change. Since 1983, a separate Acid Precipitation Special Research Grants Program has supported research on the direct effects of acid precipitation on terrestrial systems. A shift of this program into the Global Change area will bring acid precipitation research into close concert with broad-scope climate change research activity.

Nature of Change. Research is needed to assess whether methane measurements made in the laboratory (indirect calorimetry) are representative of field conditions. If biases exist, can they be quantified? Sufficient measurements have not been made of various types of animal populations, such as beef herds under range conditions. Accurate measurements of emissions from animal wastes are not available, so it will be necessary to summarize literature reports and conduct well-designed field studies to evaluate emission rates. Enhancement of animal productivity through the use of nitrogen supplements, ionophores or implants may reduce methane emissions. The use of intact males offers the opportunity to improve efficiency of muscle tissue production and thus decrease methane emissions without the use of growth adjuvants. Studies of methane emissions from wetlands and other poorly drained land areas will also be conducted. This research will facilitate the development of models to estimate how methane emissions would change as a result of various types of interventions.

Data are needed for the production of gases by current farming systems, including wetlands. Global change models need data which could be generated in these studies. With better understanding of the current level of production of "greenhouse gases" from agriculture, and of the impacts on such production by changes in management, models can be developed to assist in formulating management strategies to optimize these impacts. Research is needed to develop data on these impacts and to help plan and formulate management strategies.

The use of biomass for liquid and solid fuels provides for a short carbon cycle when such cycles are compared to conventional fuels. In addition, the use of biomass fuels reduces airborne pollutants compared to coal and oil fuels. Continued alcohol research on processes to improve yield and reduce cost, and utilization of by-products is an essential component for increased use of biomass fuels. The use of biomass fuels in co-generation systems can reduce imported energy requirements. Electrical energy production has increased in many wood-industry plants as recognition of the advantages of co-generation becomes apparent. Research continues to examine processes, policies, and equipment to increase the economics of the systems. Many wood-processing plants are energy intensive. Research into effectively reducing energy needs also reduces the impacts of energy production and use on the environment.

Forest and range ecosystems cover about two-thirds of the Nation's landmass and as such are affected by, as well as affect, the environment. The impact of overmature forests, denuded rangeland, active productive ranges and forests on the general well being of the Nation must be documented in order that political, economic, and social policies may be established to assure benefits to the Nation and its global partners. Mechanisms and interactions of ecosystems on the climate and climate on ecosystems must be understood.

These Special Research Grant funds will be used to assess the changing levels of UV-B through a monitoring network of stations. The resulting data will provide information for UV-B baseline determinations and forecasts of future levels. To save funds and time, UV-B instrumentation and support will be added to selected monitoring stations of the National Atmospheric Deposition Program/National Trends Network (NADP/NTN). For economic crops and trees, Special Research Grants will be awarded on vegetative and reproductive growth responses to different levels of UV-B radiation; whether other environmental stresses interact to either intensify UV-B damage or possibly mitigate UV-B effects; and if some crops and/or plant germplasm are resistant to high levels of UV-B. Grants will be awarded on a competitive basis to support research on effects of acidic precipitation alone or in combination with other pollutants or "greenhouse gases".

(b) An increase of $1,097,000 for Integrated Pest Management (IPM) Special Research Grants ($2,903,000 available in 1990).

Need for Change. The goal of IPM is to synchronize the management of pests with the production of the crop in a manner that will maximize economic yield, increase the efficiency of production and grower profits by reducing costs of production, sustain agricultural productivity in national and international markets, and resolve environmental and biological problems associated with past pest control approaches.

A National IPM Symposium/Workshop was held in April 1989 in which 500 multi-disciplinary scientists participated. Twenty-two reports were presented on research priorities in ten thrust areas and twelve commodity programs. The ten thrust areas were knowledge-based systems, biological control, ecological basis for weed biology, integration of cultural practices, resistance/defense mechanisms in crops, managing resistance to pesticides, threshold use and sampling procedures, law and regulatory impact on pesticide use in IPM, movement and dispersal of biotic agents, and changing role of simulation modeling. The twelve commodity reports were for potatoes, corn, soybeans, tree fruits, vegetables, cotton, small grains, rangelands, livestock and poultry, forage and alfalfa, forestry, and urban. In general, the commodity reports reflected back to the thrust areas. For example, the commodity report for pest management for vegetable production included priorities and needs for: alternative (non-pesticide, or low impact pesticide) mechanisms of pest suppression. These include development of effective biological controls for the myriad of vegetable production systems, development of cultural procedures, development and use of pest-resistant vegetable cultivars, development and appropriate use of bio-rational chemicals, and application of appropriate reduced-pesticide strategies. The published proceeding, National Integrated Pest Management Symposium/Workshop is available (November 1989).

This research will synchronize the management of pests with the production of the crop. For example, the potato crop management program in Wisconsin includes programs for the scheduling of irrigation, the management of insect, weed, and disease problems, as well as guidelines for optimum fertilization. The potato crop management program utilizes computerized disease forecasting based on environmental monitoring, dynamic treatment thresholds for the major insect pest species, fertilizer assessment and application timing to match crop requirements, weed development models, and precise irrigation management based on soil and environmental parameters. The program reduces pesticides, irrigation and fertilizer applications while maintaining economic profitability. Economic benefits of $100-140 per acre in research plots of Russet Burbank potatoes have been demonstrated compared to a conventional management program. Growers in Wisconsin have testified, "...the research behind the creation of these programs is the direction of agriculture for the future. Better management of available resources is the key to both profitability and reducing the environmental impact in agriculture today." The scientific basis of sustainable agriculture and managing environmental problems are being addressed by these IPM approaches.

Nature of Change. The priorities identified in the April 1989 Symposium/Workshop will be addressed in the regional production systems of the National Integrated Pest Management Program. Under this national program, each region addresses identified priority needs in regional production systems. The regional production systems range from irrigated/dryland production in the Western Region to the humid production systems in the Northeast. The National IPM program is uniquely designed to address the different pest problems across the range of production systems. This funding increase will expand the research activities in the IPM program and significantly increase the progress toward attaining the IPM goals.

(c) An increase of $103,000 for Minor Use Animal Drugs Special Research Grants ($226,000 available in 1990).

Need for Change. Grants are awarded in support of the National program to obtain FDA clearance of animal drugs and biologics for minor uses and minor species. The animal drug program utilizes the existing resources available through the Hatch interregional project IR-4 (A National Agricultural Program to Clear Pest Control Agents and Animal Drugs for Minor Uses) and the Regional Leader Laboratories that currently support the pesticide program. To date, the drug program has received 169 requests for clearances. Research is being conducted on 31 projects in conjunction with many universities, the U. S. Department of Interior (Fish and Wildlife Service), the Agricultural Research Service, and 14 pharmaceutical companies. Ten public master files have been published related to specific minor use, with five more pending FDA approval.

It is necessary to address the increasing need for registration of safe animal drugs and biologics for minor uses and minor species. The unavailability of such drugs, requisite to adequate animal health and protection, results in serious economic losses to producers. The high cost incurred to obtain the extensive experimental data on efficacy, safety, and residue depletion, required by Federal and local regulations, cannot profitably be borne by the animal and pharmaceutical industries for minor uses. The existing IR-4 program, working cooperatively with the U.S. Food and Drug Administration (FDA), provides the only remaining alternative to approve these types of drugs.

Nature of Change. This increase will expedite drug clearance by permitting an increase in the research necessary to respond to the extensive list of requests for approval of minor use animal drugs. By accelerating the rate of new drug clearances, the temptation for producers to use drugs without proper clearance, potentially resulting in drug residues, would be reduced. Currently, the disease losses that are encountered greatly impact profitability. An expanded minor use animal drugs program in IR-4 offers an existing coordinated mechanism to keep pace with the urgent demand for approval of effective animal drugs. This is necessary to protect both animals and the consumer.

(d) An increase of $177,000 for the National Biological Impact Assessment Program Special Research Grants ($123,000 available in 1990).

Need for Change. The National Biological Impact Assessment Program (NBIAP) has the mission to facilitate the safe field testing of genetically modified organisms. This program has successfully established an information system to meet the needs of scientists who must comply with the Federal Coordinated Framework for the Regulation of Biotechnology. The information system is comprised of a bulletin board, a series of databases and a knowledge base that uses artificial intelligence to draft applications for Federal permits for field testing with genetically modified organisms. The core components of the NBIAP Biosafety Program must now be expanded to cover additional needs of the national research community. One of these needs is more direct coordination of technical projects in biosafety research. Better coordination of specific biosafety research projects will help expand the scientific knowledge necessary for sound decisions on the safety of planned experiments and will provide better methods to assure adequate protection of the environment and public health.

Another need for change is in the area of biological monitoring. The Program must encourage the development of a nationwide monitoring system to follow-up field tests to make sure that the precautions taken are adequate to protect and preserve the environment and public safety.

Another needed change is for targeting special pilot programs in biosafety research to provide new directions for program planning and project support. Much of this would be for specific organism groups which will then, in turn, support the Biosafety Knowledge Base.

Nature of Change. Some of the existing data bases must be expanded in scope to incorporate new biosafety knowledge as it is developed through research projects and expert panels. By providing greater coordination of biosafety research through targeted technical projects, greater efficiency of resources will be realized. But new resources will be needed to call together scientists for planning and reporting of activities.

The national need for a biological monitoring system for biotechnology will be most appropriately met through the development of partnership institutions coordinated and facilitated by the NBIAP. This can best be done by calling together scientists of mutual interest and common need, and encouraging them to participate in the planning of the biological monitoring program. This will require new resources and new approaches to research organization that will be provided by the NBIAP leadership.

Biosafety research is an emerging area of science critically important to the safe field testing of genetically modified organisms. Once considered part and parcel of the normal research process, biosafety is now recognized as a separate entity that supports research through the development of methods, protocols and procedures to support safe biotechnology research. By initiating pilot programs in biosafety areas new research needs can be identified and then resources allocated to the most promising areas. Additional funding for NBIAP will allow for greatly expanding these needed efforts.

Finally, additional funding will allow expanded communications to gather information on topics such as expert opinion on research protocols and other types of information not now well documented in traditional literature. Making this information available through NBIAP will support the scientific community and consequently advance the science of biotechnology as it is applied to agriculture.

(e) An increase of $1,025,000 for Pesticide Clearance Special Research Grants ($1,975,000 available in 1990).

Need for Change. New regulatory requirements of EPA for implementation of "Good Laboratory Practices" and recent amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) passed by the 100th Congress are two major areas that need immediate action under the Pesticide Clearance (IR-4) program. If American agriculture is to have available the legally registered materials necessary to provide for a wholesome and nutritious diet for the consuming public and to supply them with the ornamental plants to beautify their environment, it is essential to meet these regulatory demands. Good Laboratory Practices will increase the work load, conservatively estimated, by about 25 percent and is being required for both field and laboratory research.

Recent FIFRA amendments greatly accelerate the need for reregistration of currently used pesticides including many used on minor crops. Reregistration of previously registered pesticides will require redoing much of the original research using current state of the art technology. The continued registration of all the fungicides and a number of herbicides is currently under review. There is no patent protection and very little economic incentive for commercial companies to reregister these older pesticides. In contrast, the economics to the user are excellent, and further, these older pesticides have been researched and incorporated into sound environmental management systems. Their loss would be a severe restriction to pest management programs.

Nature of Change. Funding will first be applied toward the increased effort needed for Good Laboratory Practices. Support is also required for the initiation of the reregistration process for minor use agricultural commodities and the initial registration of safer and more environmentally compatible pesticides. The project is inundated with requests for assistance in the registration of both chemicals and biologicals for both food and ornamental crops. There is a large backlog of valid researchable requests currently numbering about 1,200. In addition an estimated 4,500 pesticide uses might be required to be reregistered, of which about 1,000 may result in researchable projects that will not be covered by industry but are needed by the agricultural community. Thus it is anticipated that the total number of researchable projects will double to slightly more than 2,000. Since most of the pesticides subjected to reregistration are not under patent for minor uses, there is little financial incentive for private manufacturers to reregister many of them. Often there are a very limited number of pesticides registered for minor crops, and loss of registration would make minor crop production more expensive, if not prohibitive, due to lack of adequate pest control. At the $3 million funding level, approximately 90 projects can be completed per year, at an average cost per project of $33,000. To meet these demands, the research activities of the IR-4 program will be expanded to include additional field experiments and the resultant chemical analyses for residues. The final product of the increased support will be an increased number of chemical and biological products available for use on specialty crops.

(f) An increase of $531,000 for Pesticide Impact Assessment Special Research Grants ($2,437,000 available in 1990).

Need for Change. Recent regulatory reforms resulting from concerns about the impact of pesticides on man and the environment have resulted in an EPA program to reregister all pesticides. This is a special review process in which information on materials requested under previous programs is examined to determine areas of missing or incomplete data. In order to make regulatory decisions, EPA requests these data from both the public and private sectors. The large number of chemicals on the market has necessitated an acceleration by EPA of the rate special reviews are initiated. In addition, currently all fungicides are under review. Commodity assessment teams will be undertaken in FY 1990. The National Agricultural Pesticide Impact Assessment Program (NAPIAP) must be in a position to provide scientifically sound data on the impacts of these pesticides, not only as they relate to maintaining a strong agricultural economy but also human health and the environment.

Nature of Change. The increased funds will be used to support university scientists on additional assessment teams formed to meet the demands of these EPA special reviews and the USDA's proactive Commodity Assessment Teams. The increase in funds will help support the quality assurance factors (Good Laboratory Practices) required for data used in the registration process. In addition these funds will be used to support research on innovative methods to assess pesticide impacts including related water quality. Areas of emphasis would include computer models designed to examine the weight of various factors on profitability, calibration of modeling systems designed to predict movement of pesticides into groundwater, and use of electronic data systems to accelerate the data gathering process. The assessment team efforts and supporting research will place NAPIAP in a strong position to promote informed regulatory decisions on registered pesticides that significantly benefit U.S. agriculture without causing unreasonable adverse effects to humans or the environment.

(g) An increase of $3,385,000 for Water Quality Special Research Grants ($6,615,000 available in 1990).

Need for Change. Water is one of our nation's most valuable natural resources and its quality is crucial to the Nation's interests. It is essential that this natural resource be conserved and its quality maintained or improved if contaminated to assure sufficiency of good quality water for future generations. Water quality is vulnerable to contamination by increased use and disposal of toxic chemicals and other substances from industry, agriculture, forestry, and other urban and rural sources. Public concern has increased sharply because of possible health problems associated with trace levels of toxic chemical residues detected in certain public and private wells.

Science based data and information from water quality research by CSRS State cooperating institutions is urgently needed to more correctly define best management practices and other educational materials. These products will be used by agricultural producers, State agencies, Extension, SCS, and EPA to not only improve efficiency of chemical and waste use but also to respond to requirements of State and Federal legislation, while avoiding unacceptable sacrifice in agricultural profitability. This requires a thorough understanding of what happens to pesticides, fertilizers, and wastes after they are used in agriculture under widely different conditions of soils, crops, climate, and types of chemicals.

Nature of Change. Efforts must continue on research initiatives implemented in FY 1990 in response to the USDA Research Plan for Water Quality, so we can more adequately understand processes of contamination and learn how to avoid unacceptable degradation of water resources. Two research thrusts underway in FY 1990 include the integrated systems approach of the Midwest Initiative, and the Special Research Grants program of awards made on a nationwide competitive basis. The latter program addresses selected water quality research categories representing widely different soils, climate, and crop producing areas of the United States, thus making progress in response to the "Need for Change" statement.

Midwest Initiative ($3 million). The request for FY 1991 includes an increase of $38,000 resulting in a total program of $3.0 million to continue CSRS support of targeted research in the very heavy pesticide and nitrogen-use area of the Corn Belt. This multi-agency, State-Federal Midwest Initiative program begun in FY 1990 is being funded on an annual basis, thus making it highly critical to continue support to facilitate meeting the program goals. In this Initiative, scientists of the State Agricultural Experiment Stations and cooperating Federal agencies use an integrated approach to agricultural production systems research. These field evaluations of the environmental effectiveness and economic feasibility of different combinations of farming methods, that utilize potentially hazardous chemicals, will provide sound justification for changes in production practices.

This research will be in support of the Water Quality Research Implementation Plan in Agriculture, and, as appropriate, will be cooperative with ARS, ES, ERS, SCS, USGS, EPA and other agencies. Information will be generated for immediate application through education and technical assistance programs, and for development of management guidelines in other high-risk contaminant areas. Decisions on priorities for continued or modified research will be made in conjunction with an oversight committee for the Initiative and through evaluation of progress.

Nationwide Grants Initiative ($7 million). This increase of $3,347,000 resulting in a total $7.0 million grants program will produce information from research on selected categories of problems, determined on a regional basis, representing different soil, climate, and crop management conditions throughout the U.S. It is proposed that $7.0 million be available for awarding competitively with an advantage given for multidisciplinary and interstate or interagency proposals. Understanding and evaluating processes of water contamination requires several years for solution and involves very costly sampling and analytical procedures. Control of land areas through leases is necessary for periods of time adequate to effect significant movement of chemicals through the soil, or to show meaningful reduction in concentrations. This proposed increase will build on current programs and strengthen CSRS participation in collaborative interagency research on regional and national priorities for water quality.

Awards of research grants will be made to highly qualified scientists conducting research on problems of water quality degradation or enhancement, related to agricultural practices. This research will determine: Reactions of potentially hazardous agricultural chemicals with soils, water, and other chemicals; processes of retention, degradation, and movement of contaminants through soils and substrata to groundwater; improved methods of sampling and analysis; uptake by plants that could result in both the removal of contaminants from the root zone, or their cycling into products potentially harmful to humans; development of prevention and remedial technologies and systems of management that reduce use or impacts of potentially hazardous chemicals; and evaluation of economic and sociological implications of adoption or non-adoption of new systems. These efforts are essential to the success of the USDA Research Plan for Water Quality.

The FY 1989 competitively awarded program of $1.8 million attracted a large number of high-quality proposals, but the amount of available funding permitted an award rate of about 10 percent., A continued high interest among scientists is necessary to make significant progress on the water quality problem areas. In 1990 the success rate for proposals will be increased some due to the additional funding appropriated. The requested $7.0 million for the Nationwide Grants Initiative will increase the award success rate to about 25 percent, or 70 grants for the U.S. Because the dollar amount of certain awards should be increased for costly types of research vital to water quality problem solution, the number of high quality proposals that can be funded will still be limited.

(h) An increase of $56,000 for the Low Input Sustainable Agriculture Program ($4,394,000 available in 1990).

Need for Change. This program, first funded in FY 1988, is a partnership of federal agencies, universities, farmers, foundations, and industry. Contributions by project participants have more than equally matched the LISA appropriations each year. Although the program is relatively new, it has already developed reliable information on the feasibility of rotations, biological pest controls, use of green manures, and other farming practices that hold promise of significantly reducing the use of potentially harmful chemical pesticides and fertilizers. The Department of Agriculture, recognizing the need for the development and dissemination of information about these innovative farming systems, places high priority on this program. The increase would allow the Department to continue its leadership role and serve to encourage our partner organizations in the public and private sectors to continue and accelerate efforts to find productive and profitable alternatives to high-chemical farming methods.

Nature of Change. Each year a number of potentially valuable project proposals cannot be funded. With matching contributions, this proposed increase would exceed $100,000, a sum that could support a new project at one of the regional centers. The additional project activity will be based on merit review of project proposals from farmers and public and private organizations through a regional review process.

(1) A net increase of $597,000 for the Supplemental and Alternative Crops Program ($321,000 available in 1990).

Need for Change. Appropriations for supplemental and alternative crops are used to commercialize agriculturally produced strategic and critical raw materials for development of non-food industrial products and markets. Cooperative projects and programs with private industry, public institutions, and academia are planned and implemented to progressively remove agricultural and industrial barriers which impede the emergence of an agro-industrial system, an economically and technologically rational system from seed production to final product marketing. Generally, the United States is import dependent on these agricultural materials or the materials' manufactured products.

The purpose of the guayule program is to develop a natural rubber industry in the United States. The goal is to produce rubber from guayule that is competitive in price and quality with Hevea rubber. The guayule research and development program is well established and long term with commercialization likely to be five to ten years away under good conditions. Research and development programs have been conducted for less than 16 years, including the research conducted under the emergency rubber program of World War II.

The goal of the crambe/industrial rapeseed program is to commercialize high erucic acid oils from farm to factory. Vegetable oils, high in erucic acid, have special attributes that make unusual raw materials for manufacturing industrial products such as lubricants, surfactants, nylons and coatings. The comprehensive crambe/rapeseed program is three years old and just beginning to impact the production-processing-marketing-consumption system. Oils, acids and other derivatives from crambe and industrial rapeseed will help strengthen the U.S. manufacturing base, diversify agriculture and substitute for foreign imported chemical feedstocks.

Nature of Change. Important research and development will proceed in the Northern and Central Plains states for commercialization of industrial rapeseed and crambe as oil seed sources for high erucic acid at a $250,000 funding level. It is generally expected that the cooperative crambe/rapeseed program among government, private and academic institutions will result in new commercial product markets and/or substitution for imports within a three to five year period. Resources would be used for public/private partnerships for product and market development; chemical characterization of oils; improving extraction technologies; and agricultural research to improve plant yields, increase oil yields, reduce production costs, and explore meal quality for livestock and poultry feed.

Guayule research will be carried out at a $668,000 level. Genetics and plant breeding research is producing cultivars with increased rubber concentration, biomass yield, and pest resistance; agronomic research is improving cultivation (seeding, transplanting, irrigation, and harvesting); processing research is improving the storage of the shrub and the extraction of high molecular weight rubber for specification testing and product development; co-products utilization research is discovering new, value-added industrial products made from low molecular weight rubber, water soluble polymers, resins, and bagasse. This research was previously conducted under the Critical Agricultural Materials Act which has expired.

(j) A decrease of $30,231,000 for Special Research Grants, $5,300,000 for Critical Agricultural Materials Act, $469,000 for Rangeland Research Grants, $3,703,000 for Aquaculture Centers, and $3,112,000 for International Trade Development Centers.

Need for Change. These grants programs have concentrated on problems of national and local interest beyond the normal emphasis in the formula programs. The Hatch Act formula and related base funded programs constitute the core of the State-Federal research partnership and, when put together with State funding, provide the basic laboratory facilities, scientists, graduate students, and support necessary for the long term stability of agricultural research. Thus, these base programs become the highest priority of the State-Federal research partnership. Selected high priority special research grant programs will be continued.

Nature of Change. This change will eliminate this specific funding support for selected grant programs. Guayule research formerly conducted under the Critical Agricultural Materials Act which has expired is being requested under the Supplemental and Alternative Crops program. Due to the discretionary nature of the Hatch Act formula and related base funded programs, amounts allotted to State institutions permit the institutions to fund research in those areas that they identify as high priority. This flexibility could provide for maintaining some of the programs if the State institutions wish to continue the research.

(5) An increase of $57,479,000 for the National Initiative for Research on Agriculture, Food and the Environment to be funded under the Competitive Research Grants Program ($42,521,000 available in 1990).

Need for Change.

New Problems and New Tools. Agriculture in the 1990's must provide better stewardship of the environment, more rational use of natural resources, improve the quality and nutrition of food and economically stabilize production systems in order to continue to benefit producers as well as consumers. This Initiative will respond to the major issues facing agriculture such as food safety, water quality, global climate change, pest management, scientific human capital development and farm income and market competitiveness. It will allow U.S. agriculture to broaden the science and technology base to more effectively meet these demanding needs and exploit new opportunities. These imperatives coincide with recent advances in biological science and other new tools in science that present unique research opportunities to improve agriculture nationally. Unfortunately, these new opportunities cannot be fully developed because of serious under-funding for agricultural research.

New Awareness. A recent report from the Board on Agriculture of the National Academy of Sciences' National Research Council (Investing in Research: A Proposal to Strengthen the Agricultural, Food and Environmental Systems) recommends the establishment of this Initiative with new funding of $500 million per year. The Initiative has evolved as a broad national consensus of USDA research agencies, Federal and state scientists, conservationists, environmentalists, consumers, producers and processors of food and fiber along with related industries. Congruent with this recommendation, the USDA and its cooperators, in its national planning activities, have identified virtually identical national research initiatives that require major funding for the national good.

A National Need. Federal funding for the Initiative is necessary because: (1) the issues and opportunities are national in scope; the nation as a whole is the beneficiary of this effort, not just individual states or industries, (2) the Initiative undertakes research that does not in general produce specific patentable or marketable products, but knowledge that will be broadly applicable, (3) the need is urgent; the issues described below require action now and cannot be delayed or taken up piecemeal, (4) the health and vigor of a major segment of U.S. industry is at stake in terms of international competitiveness, and (5) there are benefits, although difficult to measure in economic terms, related to protection of the environment and public health.

New Urgency. The demands upon agricultural science for new knowledge have far outstripped the capacity for the USDA budget to provide needed leadership to a national agenda. Consequently, critical opportunities are missed, such as the relatively slow applications of biotechnology to agricultural uses; slow development of new crops for greater diversity or crops with improved nutrient composition, safety and post harvest quality; too few projects to use science to improve and/or protect the environment and preserve natural resources and not enough effort to reduce U.S. agricultural production cost or increase product value, which are seen as necessary first steps for increasing farm profitability and America's long term international competitiveness in agriculture.

Balanced Funding. The Federal laboratories and State Agricultural Experiment Stations (SAES) have provided the foundation for the development of technology for vastly improving agricultural production. Much of this is done through direct and formula funding which ensures a long-term stable base of support for certain kinds of research known to be important to agriculture. Formula funding also has the unique advantage of several fold leveraging of state support through matching funds. Both intramural programs and national focused State Agricultural Experiment Station programs are important to maintain national thrusts in agricultural research in established laboratories. The overall missions of these intramural programs can be defined and adjusted on a regular basis. Extramural programs, such as the Federal-state partnership of the State Agricultural Experiment Stations and other cooperating institutions provide attention to national, regional and area agricultural problems. Both programs are vitally important to the successful development of agricultural technology.

Present Departmental funding for research provides less than 5 percent for competitive research grants. The proposed Initiative would be a first step in resetting the balance with new funding to eventually reach a significantly greater portion of the total funding for research available from competitive research grants.

Funding Shortfalls. As the National Academy of Sciences report points out, "the delivery system -- SAES scientists and Extension specialists and advisors, in combination with government and the private sector...is already unduly stressed and redirection would exacerbate staffing insufficiencies for both CES and SAES." Redirection of resources would do the same to the intramural Federal laboratories. The National Academy of Sciences' report concludes that there is both an overall shortage of funding and a major deficiency in the competitively awarded funds. The Department of Agriculture concurs with this conclusion.

A major infusion of new funding is needed to allow the strengths of each research funding mechanism to do best what each is designed to accomplish. It is not simply a choice of one mechanism over another, but an intended synergy of mechanisms. Each mechanism supports the others through a balanced addressing of the entire spectrum of agricultural research needs.

Broadened Participation. It is well accepted that fundamental investigations to support a national research agenda can be effectively achieved through a competitive research grants program. An expanded USDA Competitive Research Grants Program could strengthen the USDA intramural program, since USDA scientists are eligible to compete for the grants. It would also strengthen the extramural program by extending support to other outstanding scientists to address national agriculture and natural resource problems.

Benefits. There will be numerous benefits from this new Initiative including:

- Improved health of all citizens through diet and food safety
- Enhanced stewardship of the environment
- New food and fiber product and process development
- Increased capacity to respond to a changing global environment
- Increased agricultural and natural resource production efficiency
- Increased farm profitability
- Enhanced quality of life in rural communities
- Increased size and diversity of the science base

The Initiative will address important issues in a positive manner:

- because it will be awarded competitively and peer reviewed, intellectual talent not now contributing to the solution of agricultural and natural resource problems will become positive contributors.

- because it will be available to all institutions of higher education, institutions not ordinarily addressing agricultural and natural resource problems will participate.

- because the objectives identified by the research community are issues of needed knowledge, project proposals in defined areas of science will be solicited and competitively awarded.

- because the initiative represents new support for the research community, high-priority areas of social and economic concern can be addressed in a more timely manner than is currently possible.

Nature of Change.

New Funding. The Initiative calls for a major infusion of new Federal funding for research that addresses a set of societal and industrial issues. It recognizes that there are major untapped opportunities for improving U.S. agriculture and natural resources in modern biological and related sciences, especially in biotechnology and computer sciences, to address the most critical problems.

Fundamental Support. Approximately 70 percent of the effort proposed in the Initiative will support fundamental research directed at the most urgent problems. It is from this form of science that major conceptual breakthroughs are expected to emerge. Fundamental research projects will be both individual investigator grants (40 percent) and multidisciplinary team research grants (30 percent). Other forms of grants will be directed at mission-linked multidisciplinary studies (20 percent), as well as institutional strengthening grants (10 percent).

Individual Investigator Grants will support individual scientists or investigators working within the same, or closely related, disciplines. Individual investigator grants are the foundation of the highly successful competitive grants program in the United States, and represent the most direct way to attract and retain talented scientists and their students.

Fundamental Multidisciplinary Team Grants will support collaborating scientists from two or more disciplines, focusing on basic science or engineering questions. It is often at the juncture of disciplines that new discoveries and research strategies appear.

Mission-linked Multidisciplinary Research Grants will bring early laboratory and field results to practical applications, and facilitate critical linkages with site specific research and extension activities that are already underway.

Institutional Strengthening Grants will build for the future the competitiveness of smaller, less developed institutions, and provide educational support for training future generations of agricultural, environmental and food scientists. The research strengthening grants are also a major way to provide opportunities for women, underrepresented minorities, and disabled individuals in the agricultural research system. The grants are not intended to be used for building or major capital expenditures.

Competitive Funding. Funds will be awarded on a competitive, peer reviewed basis. This form of funding mechanism is uniquely suited to stimulating new research activity in specific, high-priority areas of science and engineering. All public and private universities, research organizations, Federal agencies, private organizations or corporations, and individuals will be eligible to compete for these funds. The Initiative will allow the average amount of USDA competitive research grants to be increased and the average duration to be extended. This will make USDA competitive research grants more comparable in size and length to grants awarded by the National Science Foundation and the National Institutes of Health.

Components. There are four research components proposed in the Initiative to be funded in fiscal year 1991:

Natural Resources and the Environment ($15 million in 1991). Research activities will be directed into areas that will enhance understanding of agriculture and natural resources management systems and protection of the environment. The contributions of management systems to the degradation of the environment and, conversely, the effects of global climate change on natural resources and agriculture will be more thoroughly researched. Research will include the effects of agriculture on water quality and ways to enhance our water quality and efficient use of water. Sustaining agriculture as an environmentally and economically sound enterprise requires better understanding of the management of the natural resource base upon which agriculture is dependent.

Nutrition, Food Quality and Health ($5 million in 1991). The Initiative will allow investigation of the relationships of human health to diet and nutrition, and to food quality and safety. Growing consumer expectations for certain types and wholesomeness of food have placed new demands on food production and processing technology.

Plant Systems ($50 million in 1991). Crop and forest species need redoubled efforts to explain basic biological processes, search for new production systems that are low-input and sustainable and find alternatives for present practices which degrade the environment or are not profitable. The present "reservoir of scientific knowledge" supporting the plant sciences is inadequate for future needs. This knowledge base must be replenished as agricultural science tackles complex problems to allow for more environmentally harmonious, economically viable forest and crop production systems. A fundamental understanding of the biology of forest species is prerequisite to sustaining natural resource productivity, understanding the impact of global change, devising practices that insure the compatibility of natural resources and the environment, and developing sound pest control strategies. An integral part of this research area will be the plant genome mapping program that will decipher the complete set of genetic instructions that guide the development of important food and forest plant species.

Animal Systems ($30 million in 1991). Animal agriculture includes livestock, poultry and the rapidly emerging industries of aquaculture and non-traditional species. There is a need to find ways to improve the nutritional value and safety of animal products. There also is a need to increase the profitability of animal systems through increased value-added products and decreased costs of production. Moreover, the consequences of animal agriculture on the environment must be reduced through new technology. Proposed research will apply advanced research tools including genome mapping and genetic engineering to understand the mechanisms which control fat deposition, animal disease, and reproduction and use that knowledge to solve production and consumer issues.

To the extent that funds are awarded competitively and not earmarked for special interest purposes, it is proposed that funding for this Initiative be increased by $50.0 million annually through the outyears. In addition to the four research components that will be funded in 1991, the overall plan identifies two additional components that will be funded in future years. Research on New Products, Processes and Value-Added will allow for development of new agricultural products and processes for added value through manufacturing or bioprocessing that will represent an enormous opportunity for expanding the U.S. trade advantage. The Markets, Trade and Policy research component will help to develop a well-coordinated mixture of policies based on sound scientific principles that will bolster foreign trade.

Support to Existing Departmental Efforts. There are several major interdisciplinary efforts currently supported by the Department that relate to the Initiative. Three examples have been selected to demonstrate how they will be strengthened and expanded by the Initiative.

Global Change ($9.4 million): The current program on Global Change responds to issues outlined in the Global Change Research Plan prepared by the Committee on Earth Sciences. The USDA component of this plan deals with the impact of global change on agricultural and ecological systems and the impact of these systems on the climate. Several agencies are currently cooperating on this program.

CSRS through special research grants is obtaining accurate measurements of emissions from animal wastes. Studies of methane emissions from wetlands and other poorly drained land areas are underway. CSRS also supports a network of monitoring sites to provide accurate baseline data on the intensity of ultraviolet light and to provide forecasts of changes.

ARS is developing models for agriculture and natural resource management systems which are adaptive to possible global change stresses and also minimize their negative impacts on climate change. Research planned also includes the impact of rising concentration of carbon dioxide on plants, and methane evolution from rice, ruminant animals, and nitrous oxides.

Forest Service research concentrates on the effects of acid deposition on forests, regional scale responses of forest ecosystems to global change including hydrologic systems, wildlife and aquatic life systems as well as the impact of changing fire episodes on managed ecosystems and human communities. This research scope will broaden to include interactions between forests and the atmosphere which affect forest health, diversity, and productivity.

The Initiative will complement these agency programs by supporting a program of basic research consistent with the Committee on Earth Sciences plan. The program will provide understanding of the underlying phenomena of both global change impacts on agriculture and ecological systems and agriculture's contribution to global change. One important aspect of the program is focused on the effects of stratospheric ozone depletion and the resulting increase in ultraviolet (UV-B) light on plant growth and function.

The Initiative will also address fundamental issues associated with agriculture's need to develop energy options for replacement of large amounts of fossil fuel use and the continuing problems of acid rain, ozone impacts and particulates. An example is research to reduce CO_2. Field crops and forests fix CO_2 and when burned, this CO_2 goes back into the air. However, expanded production of biomass as an energy source sequesters more CO_2 and this is more desirable than continuing to add to the net carbon content of the air by burning fossil fuel materials. Research on the use of membranes to separate ethanol from water is a promising way to reduce the energy cost which now makes the production of ethanol as a fuel thermodynamically undesirable.

The Initiative will address improved physiological, ecological, and genetic response models for reliable predictions of productivity and health of crops and forests ecosystems due to potential changes in climate, gas concentrations, UV-B radiation levels, or air pollution. Mitigation of harmful effects through genetics or agricultural practices will also be facilitated. Companion to the physical and biological aspects of global change, a social science component to consider the human dimensions of global change is also planned.

Plant Genomic Mapping ($15 million): The Department recently established the Office of Plant Genome Mapping to provide coordination and direction for gene mapping of economically important crops and forest trees. The Office has been established within the Agricultural Research Service (ARS) and a Coordinating Committee has also been established which is co-chaired by representatives from the ARS and the Cooperative State Research Service (CSRS). Their activities will serve to enhance and assure planning and cooperation within the Department, with other Federal agencies, with the academic community and with the private sector. The program will network with genomic mapping activities in the National Institutes of Health, the National Science Foundation, the Department of Energy, the Forest Service, and other agencies as well as internationally. Coinciding with the National Research Initiative, ARS is proposing an increase of $3.674 million for plant genome research activities in 1991.

Plant genomic mapping is essential to the area of crop and forestry improvement. A comprehensive picture of the economically important genes present in plants, their arrangement and the traits that they control is important to discovering how to improve yield, plant development, nutritional content and ability to resist biotic and abiotic stresses. The discoveries of plant genome research will have wide application of benefit to agriculture well into the twenty-first century. In addition to coordination and direction of research, certain services and resources must be provided to the agricultural research community to assure efficient and effective program development. Computer based data management systems, genetic resources, new technology (particularly in automated sequencing) and fundamental knowledge in physiology and biochemistry are central for success. The Initiative will provide to this program needed resources to support plant genomic mapping. While the task is enormous, the U.S. scientific community must soon begin this effort if we are to remain on the cutting edge of scientific achievements in the plant sciences.

Water Quality ($4.6 million): Farmers, ranchers and foresters must be provided with information and technical means to independently and voluntarily address concerns for the quality of water resources. This need is now being addressed in part through a multiagency program coordinated by the USDA and State Agricultural Experiment Stations (SAES) as participants, with the U.S. Geological Survey and Environmental Protection Agency in supporting roles. The primary objectives of this multiagency, multidisciplinary program are to determine the relationships between agricultural activities and groundwater quality and to develop and induce the adoption of technically and economically effective chemical management in agricultural production strategies to protect water quality.

Participants within the Department include the the Cooperative State Research Service (CSRS) and Agricultural Research Service (ARS) who, in many instances, are jointly developing and conducting research projects in new and improved farming strategies and decision aids; sampling and analytical methodologies; pesticide degradation; chemical mobility and leaching processes; and other related problem areas of practice adoption and economic feasibility. The Economic Research Service (ERS) is contributing to the project by providing statistically valid agricultural chemical use data in specified regions. The Soil Conservation Service (SCS) and the Cooperative Extension Service (CES) will benefit from the research programs as they service the requirements of their various client groups. The Initiative would complement the existing water quality program by strengthening and expanding activities to fund additional efforts consistent with the USDA Research Plan for Water Quality.

Specific areas to be enhanced are as follows:

- Research should be undertaken that addresses integrated agricultural production practices based on principles that would conserve the quantity and quality of existing water supplies and improve water use efficiency. It would also address the problems of waste management and excess application of agricultural chemicals, degraded water quality, and the contributions of soil erosion, particularly as related to the transport of toxic chemicals.
- It would allow research to develop fundamental knowledge of surface and subsurface water flow in agricultural areas and determine the factors affecting degradation and movement of pollutants in water and soil systems. This would be done through developing basic principles of physics, chemistry, physical chemistry, and biology.
- The Initiative would also allow research into the economic and social impacts and risks of imposing needed management changes, regulations and other strategies for preventing water contamination through efforts to reduce the introduction and transport of chemicals and sediments into ground and surface waters.

It is the Department's desire to provide agricultural producers with the methods to reduce environmental concerns for water quality without restrictive regulation, and in a manner that maintains agricultural productivity. The intention is to avoid economic hardship for individual producers while sustaining an economical and safe supply of food and fiber for consumers. Increased support through the Initiative will accelerate these efforts.

There are many issues that need to be addressed in each of the research areas. The following lists reflect specific areas to be funded in 1991. The proposal guidelines will be prepared to address these issues. However, since the grants will be awarded on a competitive basis, it is not yet known if all of these issues will receive funding in fiscal year 1991. At higher funding levels in future years all research areas would receive funding.

Natural Resources and the Environment ($15 million in 1991)

Protecting water quality ($4.6 million)
    Management practices
    Risk perceptions
    Human health issues
    Contamination prevention
    Fate/movement control

- Understanding impacts of global change ($9.4 million)
    - Sustaining ecosystems
    - Predicting change
    - Management systems
    - Physiological processes

- Sustaining agriculture ($1 million)
    - Environmental quality
    - Soil-water management
    - Irrigation and drainage
    - Ecosystem productivity

Nutrition, Food Quality and Health ($5 million in 1991)

- Insuring the safety and stability of consumer foods
    - Methods of detection
    - Sources of contamination
    - Biodegradable preservation systems
    - Improved processing and packaging
    - Food safety impacts
    - Genetic alteration
    - Risk assessment
    - New products

- Optimum health through improved nutrition
    - Premature birth incidence
    - Life-span factors
    - Immune function effects
    - Carcinogens
    - Nutrition surveillance
    - Nutrient interaction
    - Obesity evaluation
    - Dietary atherogenicity
    - Biological interactions
    - Nutrient needs
    - Relationships to disease
    - Nutrient composition
    - Bioavailability

- Molecular and cellular basis of human nutrition
    - Gene expression
    - Nutrient uptake
    - Nutrient-cellular interactions
    - Nutrient status indicators
    - Nutritional requirements
    - Genetically engineered foods

Plant Systems ($50 million in 1991)

- Safe and effective management of pests
    - Pest/resistance genes
    - Plant transformation systems
    - Resistance screening
    - Control strategies
    - Integrated pest management
    - Pest management strategies
    - Risk assessment/communication
    - Biological control agents
    - Molecular biology techniques
    - Ecological impacts

- Genetic enhancement of plants
    - Plant traits
    - Genomic mapping ($15 million)
    - Gene insertion technology
    - Expression and introduction of genes
    - Germplasm preservation

- Animal and plant integrated production systems
    - New technology impacts
    - Production decision models
    - Enterprise management
    - Computer based/methodical modeling approaches

Animal Systems ($30 million in 1991)

- Controlling composition and nutritional quality of animal products
    - Human nutrition guidelines
    - Rate determining steps
    - Genetic mechanisms
    - Management systems
    - Socioeconomic impacts

- Animal health and well-being
    - Pathogenesis of diseases
    - Immunogenetics techniques
    - Disease resistance genes
    - Gene regulation and expression
    - Diagnostic testing
    - Animal well-being

- Understanding the biology of animal production and performance
    - Reproductive performance
    - Fertility improvements
    - Growth factors
    - Nutrient intake
    - Metabolic disorders
    - Management techniques
    - Early pregnancy recognition

- Genome enhancement of animal efficiency
    - Genomic mapping
    - Genetic engineering
    - New gene insertions
    - Marker genes
    - Germplasm preservation
    - Gene therapy

- Range and pasture-based animal systems
    - Habitat requirements
    - Ecological/biological consequences
    - Alternative grazing systems
    - Complimentary uses
    - Physiological/biochemical basis
    - Integrated grazing strategies
    - Marketing
    - Air/water quality

In addition to the program areas that will be supported at the $100 million level, the overall plan will support funding for many other research areas including conservation and efficient use of water, sustaining natural resource productivity, land and wildlife management, development of new processing technologies and added value, rural community and economic development, and international markets and trade. The research agenda for the Initiative is both, extensive and intensive. The needs for the research are enormous and the opportunities are at hand. The Initiative is a bold step forward to provide the scientific basis to assure agricultural productivity for future generations in ways that are compatible with the environment, safe for the consumer and viable for the producer.

(6) A decrease of $5,407,000 for Animal Health and Disease Research, Section 1433, P.L. 95-113 ($5,407,000 available in 1990).

Need for Change. The Animal Health and Disease Research program has provided funds on a formula basis for livestock and poultry disease research at accredited colleges of veterinary medicine and State Agricultural Experiment Stations. For the purpose intended, this is not the most desirable mechanism for program delivery and the types of research formerly conducted under this program may be continued under the expanded Animal Systems component of the National Research Initiative. The National Research Initiative will better target funds to projects of highest scientific merit and most closely tied to national priorities.

Nature of Change. This change will eliminate formula funding for this program. Animal health and disease research is being conducted in other ongoing Federal and State research programs. The CSRS animal health research previously conducted under this formula program, as well as under the Special Research Grants program, may be continued under the Animal Systems component of the National Research Initiative. A consolidated animal health program will provide a focus for innovative approaches to solving fundamental problems in animal health and disease in food and fiber animals.

(7) A net decrease of $1,097,000 for Federal Administration (direct appropriation) ($13,336,000 available in 1990) consisting of:

(a) A decrease of $3,195,000 for the Gulf Coast shrimp aquaculture project. Prior funding has supported the initial development of this project. Emphasis is placed on high priority national interest programs in the 1991 CSRS budget.

(b) A decrease of $617,000 for curriculum development and strengthening at Mississippi Valley State University. Prior funding has supported the initial development of this project. Emphasis is placed on high priority national interest programs in the 1991 CSRS budget.

(c) A decrease of $741,000 for the Center for Agricultural and Rural Development in Iowa. Prior funding has supported the initial development of this project. Emphasis is placed on high priority national interest programs in the 1991 CSRS budget.

(d) A decrease of $494,000 for the geographic information system pilot program. Prior funding has supported the initial development of this project. Emphasis is placed on high priority national interest programs in the 1991 CSRS budget.

(e) A decrease of $1,687,000 for water quality research in Illinois, Iowa and North Dakota. Prior funding has supported the initial development of these projects. Funding is requested for water quality under the Special Research grants program, as part of the Federal government's water quality initiative, and these States may compete for these funds.

(f) A decrease of $568,000 for the Office of Grants and Program Systems (OGPS). The requested funding level is consistent with related program funding requests.

(g) An increase of $278,000 for the Office of Agricultural Biotechnology (OAB). The U. S. Department of Agriculture recognizes that the science of biotechnology holds great promise for improving the quality and availability of our food and fiber supplies, maintaining our position in the international marketplace, and enhancing our natural resources. In order to assure program coordination and operational efficiency, the Office of Agricultural Biotechnology has been established. The OAB has primary responsibility for coordinating the Department's policies and procedures pertaining to all facets of agricultural biotechnology. As biotechnology-related programs continue to grow within USDA and other Federal agencies, interagency coordination will become more crucial. It is important for USDA to assure that Federal, academic, and industrial biotechnology activities are subject to the same or closely comparable standards of research and product safety review. The functions of the OAB are to coordinate biotechnology activities within USDA, to develop biotechnology review procedures where they are needed, to assist in the development of USDA biotechnology research guidelines and review procedures to help assure the biosafety of agricultural biotechnology research, to provide staff support for biotechnology committees, and to develop selected information registries of biotechnology activities. The 1991 Request includes $500,000 for the operating costs of the OAB. The activities of the OAB will help USDA to provide mechanisms by which the scientific community can provide adequate guidance to individual investigators in evaluating the safety of planned introductions of bioengineered organisms into agricultural ecosystems. At the same time, it should help to build public confidence that agricultural research involving biotechnology is being conducted in a manner that is compatible with both human health and the environment. The OAB staff receives many requests to support and participate in biotechnology related meetings, symposia, workshops, and conferences.

(h) An increase of $65,000 for the Agriculture in the Classroom program. In order to educate, inform, and bring about a better appreciation and understanding of American agriculture among the nation's young people, USDA established the "Ag in the Classroom" program. Administrative responsibility for the "Ag in the Classroom" program has been assigned to the Assistant Secretary for Science and Education. The 1991 Request includes $200,000 for the operating costs of this program.

(i) An increase of $153,000 for peer panel costs. Cooperative State Research Service uses the peer panel review process to evaluate proposals submitted under the National Research Initiative, the Special Research Grants program, the Higher Education programs and the Small Business Innovation Research program. This request provides for the increased cost of travel and honorarium for the peer panel members.

(j) An increase of $139,000 which represents 50 percent of the 1991 pay raise. The remaining 50 percent of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(k) An increase of $5,570,000 for the 1890 Institutions Capacity Building Grants program ($5,430,000 available in 1990).

Need for Change: There is an urgent need to train more minority scientists and professionals to serve the Nation's food and agricultural system. The 1890 land-grant institutions and Tuskegee University are major producers of this sorely needed human capital. A recently completed facilities improvement program has funded construction of modern research labs at the 1890 institutions and Tuskegee University. Yet, there remains a need to develop improved linkages with Federal agencies, other universities, and private organizations to strengthen research and teaching programs in national priority issues. The Federal initiative serves the need to broaden collaboration among these key institutions, other universities, and the private sector in order to mainstream the development of minority expertise.

Nature of Change. The 1890 Institutions Capacity Building Grants Program serves as the crux of the Department's high priority initiative to advance the teaching and research capacity of the 1890 institutions and Tuskegee University. It differs from the earlier 1890 Strengthening Grants Program in that it is competitive and beginning in 1991 will require dollar-for-dollar matching funds from non-Federal sources. It also requires cooperation with one or more USDA agencies in developing a proposal and in implementing and carrying out the capacity building project. Projects concerning research activities must address a high-priority research initiative in an area where there is a shortage of capabilities and/or in which it is feasible for the applicant to develop a program recognized for its excellence. Projects concerning teaching programs must focus on a targeted need where it can be demonstrated that there is a national need for future graduates, there is not an excess of academic programs available in the area and particularly in the geographic area served by the school, and/or the outcome of the project will strengthen the applicant institution and holds potential for strengthening other colleges and universities.

(8) A net increase of $112,000 for higher education ($8,738,000 available in 1990) consisting of:

(a) An increase of $1,184,000 for Higher Education - Pre-doctoral Graduate Training Grants ($2,816,000 available in 1990).

Need for Change. The training of food and agricultural scientists is being impeded by a variety of factors. Consequently, the U. S. is producing only 1,000 doctoral degrees annually in agriculture and natural resources and more than a third of these are earned by foreign students who return to their native country subsequent to graduation. Only about 14 U. S. citizen Ph.D's per state per year are being produced. The bottom line is that U. S. higher education programs in the food and agricultural sciences lack the opportunities and competitive posture available to other disciplines such as engineering, health sciences, and computer sciences for recruiting and training academically outstanding students.

The USDA National Needs Graduate Training Grants Program, initiated in 1984, has achieved a notable record and is proving to be an important part of the solution to the serious erosion of our food and agricultural scientific expertise. The 420 fellows supported by the program to date are characterized by superior intellectual and scholarly competence. The average Graduate Record Examination score for doctoral fellows is 1,300 and 1,050 for master's fellows. The topics chosen by fellows include studies in molecular biology, plant biotechnology, animal disease, water management, nutritional sciences, international marketing, and systems management. The quality of scientific expertise emanating from this program promises to be outstanding and strongly attests to the value of a cooperative partnership between the higher education system, the USDA, and the Congress.

Nature of Change. Total funds requested will support the recruitment and three years of training for approximately 65 academically outstanding doctoral students (U. S. citizens) in targeted specializations characterized by shortages of expertise.

About 30 master's fellows (also U. S. citizens) will be recruited and supported for two years of study, thereby enabling the 1890 institutions to compete for grants under the program. Program regulations will require that part of the fellowships be awarded to minority fellows. No other program specifically targets support for training minority master's and doctoral students in the food and agricultural sciences.

(b) An increase of $1,013,000 for Higher Education - Institution Challenge Grants ($987,000 available in 1990).

Need for Change. The nation's colleges of agriculture and natural resources are the predominant producers of scientists, professionals, and managers with food and agricultural expertise. They offer the greatest potential for the future development of sophisticated agricultural mindpower. Yet, they are losing ground daily due to a multitude of problems. Efforts must be taken to revitalize these educational programs which are primarily responsible for the development of future generations of food and agricultural scientific and professional expertise. An expanded Federal initiative to strengthen these higher education programs, comparable to highly successful Federal initiatives on behalf of other science and engineering disciplines, is sorely needed.

Nature of Change. This increase is proposed for the competitive Institution Challenge Grants Program which requires non-Federal matching funds. The program is designed to ameliorate targeted national problems, such as inadequate minority and female participation, which are enervating the U. S. food and agricultural sciences higher education system and which transcend the capacity of individual institutions to resolve. The program is designed to foster partnership ventures that include:

- Curricula revitalization -- biotechnology, agribusiness management, systems analysis and problem solving, ethics and public policy, communications, leadership development, etc.
- Faculty development -- shared faculty appointments between institutions or the private sector, sabbaticals, etc.
- Scientific instrumentation for teaching -- mobile laboratories with highly specialized equipment, satellite access to industry and government laboratories, etc.
- Undergraduate research -- formally introduce undergraduate students to empirical research methodologies and require students to design and manage the scientific pursuit of basic and applied knowledge.
- Student recruitment and retention -- multiuniversity and/or regional media campaigns, outreach programs with high school science classes, specialized workshops for recruitment personnel, and development of career information tailored for special populations such as Hispanics and blacks.

(c) A decrease of $1,878,000 for Higher Education - 1890 Strengthening Grants ($1,878,000 available in 1990).

Need for Change. The need for qualified minority scientists and professionals to serve the Nation's food and agricultural system is so great that a more comprehensive program is proposed. The 1890 Institutions Capacity Building Grants program incorporates and expands on the opportunities previously available under the 1890 Strengthening Grants Program.

Nature of Change. In 1991 no funding is proposed for the 1890 Strengthening Grants Program. The 1890 Institutions Capacity Building Grants Program subsumes and greatly broadens the impact of the original 1890 Strengthening Grants Program. This program is competitive, will require non-Federal matching funds, and opens up a broader arena of initiatives aimed at improving the quality of food and agricultural sciences teaching and research programs at the 1890 Colleges and Universities and Tuskegee University.

(d) An increase of $40,000 for the Morrill-Nelson program ($2,810,000 available in 1990).

Need for Change. The Federal government has supported higher education in the food and agricultural sciences at land-grant institutions through a permanent appropriation in the Second Morrill Act of 1890. The funding level has remained at the $50,000 level for each State and territory since 1912.

Nature of Change. This program was reduced by $40,000 in 1990 due to the Omnibus Reconciliation Act of 1989. This increase will allow the 57 States and territories to receive the full $50,000 authorized by the permanent appropriation. However, legislation is being proposed to eliminate the authorization for the Morrill-Nelson permanent appropriation.

(e) A decrease of $247,000 for the Aquaculture Vocational Agriculture Curriculum Program ($247,000 available in 1990). Prior funding has supported the initial development of this project. Emphasis is placed on high priority national interest programs in the 1991 CSRS budget.

SMALL BUSINESS INNOVATION RESEARCH PROGRAM

The Small Business Innovation Development Act, Public Law 97-219, July 22, 1982, as amended by Public Law 99-443, October 6, 1986, was designed to strengthen the role of small, innovative firms in Federally funded research and development. It directs that small firms receive at least a fixed minimum percentage of research and development awards made by Federal agencies with sizable research and development budgets. Beginning in fiscal year 1986, and all subsequent fiscal years, 1.25 percent of an agency's extramural research budget is set aside for purposes of the SBIR Act.

Agency	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate
Agricultural Cooperative Service	$3,125	$1,000	- -
Agricultural Research Service	175,000	175,000	$175,000
Cooperative State Research Service	3,666,362	3,830,788	3,972,175
Economic Research Service	12,500	6,925	6,925
Forest Service	58,750	59,840	60,625
Human Nutrition Information Service	26,375	30,000	30,000
National Agricultural Statistics Service .	3,400	2,538	2,538
Total	3,945,512	4,106,091	4,247,263

The functions of the SBIR program, the solicitation, review and evaluation of proposals have been centralized in order to most effectively and efficiently serve the SBIR community. Six research topic areas have been established:

1. Forests and Related Resources. Proposals were solicited to develop environmentally sound techniques to increase productivity of forest land and to increase the utilization of materials and resources from forest lands.

2. Plant Production and Protection. Research proposals were solicited to examine means of enhancing crop production by reducing the impact of destructive agents, developing effective crop systems that are economically and environmentally sound, enhancing the impact of new methods of plant manipulation, and developing new crop plants and new uses for existing crops.

3. Animal Production and Protection. Research proposals were solicited to find ways to enable producers of food animals to increase production efficiency and to assure a reliable and safe supply of animal protein and other animal products while conserving resources and reducing production costs.

4. Air, Water and Soils. Research proposals were solicited to develop technologies for conserving soil, water and air resources while sustaining optimum agricultural productivity.

5. Food Science and Nutrition. Research proposals were solicited to develop new knowledge and a better understanding of the characteristics of foods and their nutritional impact; to apply new knowledge to improve our foods and diets; and to apply new knowledge to the production of useful new food products, processes, materials, and systems.

6. Rural and Community Development. Research proposals were solicited to promote, foster, or improve the well-being of rural Americans.

Current Activities. In response to the September 1, 1988, deadline announced in the Federal Register, the Department of Agriculture received 309 Phase I proposals from small businesses that had innovative approaches to solve problems in U.S. agriculture. On February ~~1, 1989,~~ 20 Phase II proposals were submitted by small businesses that had previously received Phase I awards. The agency contributions were pooled and grants were made without regard to the funding source. The proposals were peer reviewed and many high quality applications were identified. With the funds available for the program 39 awards (26 Phase I awards and 13 Phase II awards) could be made. A summary for fiscal year 1989 follows:

Program Area	Number of Proposals Received	Amount Requested	Number of Grants Awarded	Amount of Awards
Forest and Related Resources	49	$3,160,240	8	$889,887
Plant Production and Protection .	82	5,310,227	12	1,278,074
Animal Production and Protection.	84	4,688,885	8	712,596
Air, Water and Soils	28	1,645,179	2	99,960
Food Science and Nutrition	35	1,882,087	4	364,995
Rural and Community Development .	51	3,336,931	5	600,000
Total	329	20,023,549	39	3,945,512

Selected Examples of Recent Progress:

Forests and Related Resources. Many of our timber resources are located in rugged terrain where cable logging systems need to be used to harvest the trees in an environmentally sound fashion. The cables have to be securely anchored and in many cases the only place to anchor them is directly in bed rock. A Massachusetts company has developed a seismic technique to permit an accurate prediction of the ability of the rock to hold an anchor. Such information will indicate how many anchors are needed and how deep they have to be placed to provide a secure foundation for the cable system. This technology will permit the safe harvesting of timber resources that are presently unavailable because of the difficult terrain.

Plant Production and Protection. There is a great need for environmentally sound control strategies for major insect pests. Potentially one of the most effective biocontrol approaches is to utilize entomogenous nematodes that attack and destroy a wide range of insect pests. A firm in California is working to develop procedures for the mass production of entomogenous nematodes and for their desiccation to permit successful long term storage. If these efforts are successful it will be possible to develop control strategies that utilize entomogenous nematodes as an important component.

Animal Production and Protection. There is growing interest in the improvement of the efficiency of livestock production. Feed costs represent the largest component in the total cost of livestock production. Water consumption may influence feed intake and efficiency of production. A Tennessee company is developing an automatic system for monitoring water consumption in individual animals. This information will prove valuable to animal research and will help improve the efficiency of livestock production.

Air, Water and Soils. Developing methods to improve the efficiency of water use in irrigation is very important. Systems that use manually operated irrigation valves are manpower intensive and wasteful in terms of water loss. A firm in Washington is developing a radio telemetry control system that will permit remote control of individual irrigation valves from a central location by one operator. The irrigation valves will be self-cleaning and have very low power requirements. This technology is expected to lead to a substantial improvement in water use efficiency and a reduction in manpower and operating costs.

Food Science and Nutrition. The food processing industry has to meet stringent quality control criteria to produce products that are safe and meet consumer needs. A Virginia company is testing the feasibility of using a microwave system to detect variations in fat and moisture content, and the presence of bones or other foreign objects in processed foods. Most current inspection systems can only evaluate surface properties of foods, while microwave detectors have the ability to detect objects buried in the food. This technology offers the promise of increasing the reliability of food-processing operations and leading to improved food safety.

Rural and Community Development. Many people in rural areas have varying degrees of educational deficiencies and consequently have difficulty securing permanent employment. For these people it is very difficult to learn a new skill just by reading due to their poor reading ability. A North Carolina business is attempting to address this problem by developing an interactive laserdisc system that combines video, audio and text in a package that is much easier for these people to absorb. The company is developing programs on micro-business development and will offer these programs to the target audience through the North Carolina Community College System. Application of interactive laserdisc technology to the problem of educationally disadvantaged people in rural areas has great promise for improving economic opportunities for these people.

TABLE 1
DISTRIBUTION OF FEDERAL PAYMENTS FOR RESEARCH AND EDUCATION AT STATE AGRICULTURAL EXPERIMENT STATIONS AND OTHER STATE INSTITUTIONS - FISCAL YEAR 1989

STATE	HATCH ACT, AS AMENDED			COOP. FORESTRY RESEARCH (94-5)	1890 COLLEGES & TUSKEGEE UNIVERSITY	ANIMAL HEALTH & DISEASE RESEARCH	SPECIAL RESEARCH GRANTS	COMPETITIVE RESEARCH GRANTS	HIGHER EDUCATION GRANTS	FEDERAL ADMIN. (DIRECT APPROP.)	RESEARCH FACILITIES	TOTAL FEDERAL FUNDS
	REGULAR FORMULA	REGIONAL RESEARCH	TOTAL									
ALABAMA	2,640,008	725,011	3,365,019	569,443	2,742,916	110,726	607,085	100,000	254,994	0	0	7,750,183
ALASKA	712,245	123,458	835,703	351,541	0	11,987	5,000	0	50,000	0	0	1,254,181
AMERICAN SAMOA	290,000	0	290,000	0	0	0	0	0	50,000	0	0	340,000
ARIZONA	982,738	652,786	1,635,524	242,590	0	59,201	209,526	1,354,000	50,000	0	0	3,550,841
ARKANSAS	2,266,340	635,403	2,901,743	482,282	1,202,089	73,641	2,156,144	200,000	152,497	0	194,000	7,362,346
CALIFORNIA	2,943,142	1,359,905	4,303,047	525,862	0	385,413	3,090,470	5,408,400	434,000	0	0	14,142,192
COLORADO	1,326,056	936,140	2,262,196	286,170	0	241,605	709,626	384,000	194,000	0	0	4,077,597
CONNECTICUT	1,116,029	426,034	1,542,063	188,115	0	22,604	362,017	90,000	50,000	0	0	2,254,799
DELAWARE	770,043	318,690	1,088,733	100,953	472,283	18,708	124,000	200,000	152,496	0	0	2,157,118
DISTRICT OF COLUMBIA	387,208	92,009	479,217	0	0	0	0	100,000	152,497	0	0	731,714
FLORIDA	1,857,696	589,344	2,447,040	471,387	985,735	166,954	1,330,192	1,744,000	296,496	0	582,000	8,008,804
GEORGIA	2,936,531	1,028,061	3,964,592	580,338	1,513,308	139,799	1,653,898	1,000,000	152,497	0	452,990	9,457,417
GUAM	614,366	105,712	720,078	0	0	0	228,550	0	50,000	0	0	998,628
HAWAII	767,054	331,022	1,098,076	122,744	0	7,992	2,899,019	0	50,000	1,933,746	48,500	6,160,077
IDAHO	1,242,525	526,665	1,769,190	384,226	0	67,440	606,756	0	50,000	0	0	2,877,612
ILLINOIS	3,713,518	868,361	4,581,879	253,484	0	163,163	632,236	2,435,000	272,440	0	242,500	8,580,702
INDIANA	3,388,236	731,854	4,120,090	307,961	0	100,047	1,810,571	1,165,257	338,000	0	0	7,841,926
IOWA	3,541,169	1,331,208	4,872,377	155,429	0	275,358	3,390,346	980,000	50,000	1,628,387	1,930,300	13,282,197
KANSAS	2,167,762	672,847	2,840,609	166,324	0	169,149	1,271,084	440,000	50,000	0	1,358,000	6,295,166
KENTUCKY	3,439,140	726,029	4,165,169	362,436	1,720,917	90,699	469,214	711,000	152,496	0	0	7,671,931
LOUISIANA	2,095,614	599,764	2,695,378	504,073	1,098,367	69,928	504,709	472,334	152,497	0	0	5,517,286
MAINE	1,090,537	444,035	1,534,572	498,178	0	16,254	332,121	120,000	50,000	0	0	2,546,125
MARYLAND	1,508,294	558,708	2,067,002	209,905	808,585	45,714	388,846	1,147,000	248,496	0	0	5,210,548
MASSACHUSETTS	1,318,901	545,374	1,864,275	231,695	0	42,211	966,909	513,898	50,000	0	0	3,668,988
MICHIGAN	3,419,929	770,604	4,190,533	514,968	0	97,985	4,597,261	1,399,410	338,000	0	1,212,500	12,350,607
MICRONESIA	290,000	0	290,000	0	0	0	0	0	50,000	0	0	340,000
MINNESOTA	3,335,073	862,633	4,197,706	416,912	0	171,485	655,516	836,442	50,000	0	0	6,328,061
MISSISSIPPI	2,739,757	733,158	3,472,915	558,548	1,420,528	69,522	5,632,515	0	152,497	1,298,250	388,000	12,987,775
MISSOURI	3,221,817	686,058	3,907,875	340,646	1,617,000	171,223	567,004	1,025,012	152,497	0	0	7,781,257
MONTANA	1,175,468	576,397	1,751,865	373,331	0	79,449	161,286	158,000	50,000	0	48,500	2,622,431
NEBRASKA	2,003,094	778,529	2,781,623	133,639	0	177,438	1,457,794	648,545	98,000	0	242,500	5,539,539
NEVADA	704,250	315,590	1,019,840	57,373	0	23,276	5,000	323,000	50,000	0	0	1,478,489
NEW HAMPSHIRE	879,926	319,357	1,199,283	275,275	0	9,698	5,000	100,000	50,000	0	0	1,639,256
NEW JERSEY	1,296,606	1,009,383	2,305,989	177,219	0	21,747	753,828	558,000	194,000	0	242,500	4,253,283
NEW MEXICO	1,014,624	347,227	1,361,851	220,800	0	38,618	630,823	0	50,000	0	0	2,302,092
NEW YORK	3,284,212	1,334,924	4,619,136	498,177	0	297,041	1,253,772	3,605,938	146,000	0	0	10,415,064
NORTH CAROLINA	4,464,299	1,039,660	5,503,959	547,653	2,184,915	111,112	241,535	504,000	392,497	0	0	9,485,671
NORTH DAKOTA	1,488,516	516,964	2,005,480	68,268	0	55,690	2,781,168	0	50,000	0	4,592,950	9,553,556

STATE	HATCH ACT, AS AMENDED			COOP. FORESTRY RESEARCH (M-S)	1890 COLLEGES & TUSKEGEE UNIVERSITY	ANIMAL HEALTH & DISEASE RESEARCH	SPECIAL RESEARCH GRANTS	COMPETITIVE RESEARCH GRANTS	HIGHER EDUCATION GRANTS	FEDERAL ADMIN. (DIRECT APPROP.)	RESEARCH FACILITIES	TOTAL FEDERAL FUNDS
	REGULAR FORMULA	REGIONAL RESEARCH	TOTAL									
NORTHERN MARIANAS	487,272	0	487,272	0	0	0	0	0	50,000	0	0	537,272
OHIO	4,052,849	832,253	4,885,102	318,856	0	111,773	1,596,686	1,014,408	194,000	0	0	8,120,825
OKLAHOMA	2,069,125	521,358	2,590,483	297,065	1,099,554	109,810	1,405,279	320,000	200,496	0	0	6,022,687
OREGON	1,551,330	816,367	2,367,697	602,129	0	92,089	2,316,225	845,157	146,000	0	7,275,000	13,644,297
PENNSYLVANIA	4,035,090	1,097,074	5,132,164	405,017	0	147,586	1,315,728	1,537,861	98,000	0	0	8,637,355
PUERTO RICO	2,962,515	645,587	3,608,102	79,168	0	12,385	512,156	0	50,000	0	0	4,261,806
RHODE ISLAND	708,662	330,693	1,039,355	90,058	0	6,599	27,300	5,000	50,000	0	0	1,218,312
SOUTH CAROLINA	2,293,928	598,747	2,892,675	449,597	1,194,949	21,600	648,508	50,000	152,496	0	0	5,409,825
SOUTH DAKOTA	1,528,071	521,371	2,049,442	111,848	0	89,816	257,208	100,000	50,000	0	97,000	2,755,314
TENNESSEE	3,307,440	742,323	4,049,763	395,121	1,659,999	66,265	282,795	308,000	152,497	0	0	6,909,420
TEXAS	4,265,871	1,055,953	5,321,824	438,702	2,143,675	367,752	1,598,809	980,399	296,497	0	1,212,500	12,355,158
UTAH	891,429	594,914	1,486,343	144,534	0	45,277	196,984	630,000	50,000	0	0	2,553,138
VERMONT	935,306	291,622	1,226,928	264,380	0	17,627	1,297,482	50,000	50,000	0	1,406,500	4,312,917
VIRGIN ISLANDS	600,656	103,865	704,521	0	0	0	197,085	0	50,000	0	0	951,606
VIRGINIA	2,823,248	707,188	3,530,436	460,492	1,432,207	98,668	425,445	60,000	200,497	0	145,500	6,353,265
WASHINGTON	1,709,448	1,295,614	3,005,062	591,283	0	132,895	2,335,179	1,187,508	194,000	0	5,121,600	12,567,477
WEST VIRGINIA	1,790,954	465,370	2,256,324	329,751	0	12,579	668,250	180,000	50,000	0	1,881,360	5,328,264
WISCONSIN	3,344,497	869,174	4,213,671	427,807	0	192,890	731,378	2,289,199	50,000	0	48,500	7,953,365
WYOMING	836,962	467,382	1,304,344	188,114	0	42,946	47,400	80,000	50,000	0	0	1,712,804
OTHER	0	204,400	204,400	0	36,100	0	396,875	0	0	0	0	637,375
SMALL BUSINESS SET-ASIDE	1,436,774	452,154	1,888,928	212,188	295,038	65,712	674,117	476,592	0	53,787	0	3,666,362
SUBTOTAL	114,124,150	36,172,313	150,296,463	16,975,000	23,603,010	5,256,960	59,411,710	38,127,360	7,461,380	4,909,170	28,673,200	334,714,253
UNOBLIGATED BALANCE	817,798	0	817,798	0	0	0	0	0	0	0	921,500	1,739,298
SUBTOTAL	114,941,948	36,172,313	151,114,261	16,975,000	23,603,010	5,256,960	59,411,710	38,127,360	7,461,380	4,909,170	29,594,700	336,453,551
FEDERAL ADMIN.	0	0	4,410,309	525,000	729,990	219,040	2,269,290	1,588,640	142,620	1,467,830	976,800	12,329,519
UNOBLIGATED BALANCE	0	0	20,430	0	0	0	0	0	0	0	198,500	218,930
SUBTOTAL	0	0	4,430,739	525,000	729,990	219,040	2,269,290	1,588,640	142,620	1,467,830	1,175,300	12,548,449
TOTAL	114,941,948	36,172,313	155,545,000	17,500,000	24,333,000	5,476,000	61,681,000	39,716,000	7,604,000	6,377,000	30,770,000	349,002,000

Table 2
Payments to State Agricultural Experiment Stations under the Hatch Act

State	FY 1989 Actual			FY 1990 Estimate			FY 1991 Est.
	Regular Formula	Regional Research	Total	Regular Formula	Regional Research	Total	Regular Formula
Alabama	$2,640,008	$725,011	$3,365,019	$2,633,184	$719,464	$3,352,648	$2,682,050
Alaska........	712,245	123,458	835,703	710,245	122,753	832,998	724,566
American Samoa	290,000	0	290,000	591,918	0	591,918	604,408
Arizona	982,738	652,786	1,635,524	979,843	649,060	1,628,903	1,000,573
Arkansas	2,266,340	635,403	2,901,743	2,260,000	630,542	2,890,542	2,305,395
California ...	2,943,142	1,359,905	4,303,047	2,933,323	1,340,388	4,273,711	3,003,632
Colorado	1,326,056	936,140	2,262,196	1,321,911	930,385	2,252,296	1,351,589
Connecticut ..	1,116,029	426,034	1,542,063	1,112,826	424,621	1,537,447	1,135,761
Delaware	770,043	318,690	1,088,733	767,770	321,551	1,089,321	784,042
Dist. of Col.	387,208	92,009	479,217	473,334	91,702	565,036	485,416
Florida	1,857,696	589,344	2,447,040	1,851,559	571,934	2,423,493	1,895,502
Georgia.......	2,936,531	1,028,061	3,964,592	2,927,947	1,018,054	3,946,001	2,989,412
Guam	614,366	105,712	720,078	612,543	105,109	717,652	625,595
Hawaii	767,054	331,022	1,098,076	764,999	329,133	1,094,132	779,712
Idaho	1,242,525	526,665	1,769,190	1,238,419	511,729	1,750,148	1,267,821
Illinois......	3,713,518	868,361	4,581,879	3,700,976	864,485	4,565,461	3,790,784
Indiana	3,388,236	731,854	4,120,090	3,376,412	728,586	4,104,998	3,461,074
Iowa..........	3,541,169	1,331,208	4,872,377	3,528,370	1,343,046	4,871,416	3,620,013
Kansas	2,167,762	672,847	2,840,609	2,160,638	669,842	2,830,480	2,211,647
Kentucky	3,439,140	726,029	4,165,169	3,428,354	720,476	4,148,830	3,505,578
Louisiana	2,095,614	599,764	2,695,378	2,089,914	595,175	2,685,089	2,130,728
Maine	1,090,537	444,035	1,534,572	1,087,327	443,988	1,531,315	1,110,312
Maryland	1,508,294	558,708	2,067,002	1,503,907	556,856	2,060,763	1,535,319
Massachusetts.	1,318,901	545,374	1,864,275	1,315,087	543,564	1,858,651	1,342,399
Michigan	3,419,929	770,604	4,190,533	3,408,747	767,164	4,175,911	3,488,810
Micronesia ...	290,000	0	290,000	620,862	0	620,862	634,669
Minnesota	3,335,073	862,633	4,197,706	3,323,645	806,553	4,130,198	3,405,467
Mississippi ..	2,739,757	733,158	3,472,915	2,733,468	727,547	3,461,015	2,778,498
Missouri	3,221,817	686,058	3,907,875	3,210,681	682,995	3,893,676	3,290,420
Montana	1,175,468	576,397	1,751,865	1,171,730	573,106	1,744,836	1,198,494
Nebraska	2,003,094	778,529	2,781,623	1,996,278	775,054	2,771,332	2,045,081
Nevada	704,250	315,590	1,019,840	702,199	313,789	1,015,988	716,887
New Hampshire.	879,926	319,357	1,199,283	877,186	318,298	1,195,484	896,801
New Jersey....	1,296,606	1,009,383	2,305,989	1,292,839	990,666	2,283,505	1,319,811
New Mexico ...	1,014,624	347,227	1,361,851	1,011,747	345,246	1,356,993	1,032,348
New York	3,284,212	1,334,924	4,619,136	3,274,254	1,318,972	4,593,226	3,345,551
North Carolina	4,464,299	1,039,660	5,503,959	4,452,161	1,031,705	5,483,866	4,539,068
North Dakota .	1,488,516	516,964	2,005,480	1,483,848	514,656	1,998,504	1,517,273
N. Marianas ..	487,272	0	487,272	579,073	0	579,073	591,467
Ohio	4,052,849	832,253	4,885,102	4,039,246	828,538	4,867,784	4,136,644
Oklahoma	2,069,125	521,358	2,590,483	2,062,534	517,368	2,579,902	2,109,724
Oregon	1,551,330	816,367	2,367,697	1,546,182	811,708	2,357,890	1,583,038
Pennsylvania .	4,035,090	1,097,074	5,132,164	4,022,419	1,084,099	5,106,518	4,113,145
Puerto Rico ..	2,962,515	645,587	3,608,102	2,957,712	640,647	3,598,359	2,992,104
Rhode Island .	708,662	330,693	1,039,355	706,697	329,594	1,036,291	720,769
South Carolina	2,293,928	598,747	2,892,675	2,288,111	594,166	2,882,277	2,329,758
South Dakota .	1,528,071	521,371	2,049,442	1,523,132	519,042	2,042,174	1,558,499
Tennessee	3,307,440	742,323	4,049,763	3,298,137	736,644	4,034,781	3,364,747
Texas	4,265,871	1,055,953	5,321,824	4,252,292	1,047,872	5,300,164	4,349,519
Utah	891,429	594,914	1,486,343	888,867	591,517	1,480,384	907,210
Vermont	935,306	291,622	1,226,928	932,522	279,093	1,211,615	952,450
Virgin Islands	600,656	103,865	704,521	598,845	103,070	701,915	611,812
Virginia	2,823,248	707,188	3,530,436	2,815,326	673,992	3,489,318	2,872,048
Washington ...	1,769,448	1,235,614	3,005,062	1,763,706	1,245,516	3,009,222	1,804,821
West Virginia.	1,790,954	465,370	2,256,324	1,786,074	467,113	2,253,187	1,821,019
Wisconsin	3,344,497	869,174	4,213,671	3,333,104	872,700	4,205,804	3,414,682
Wyoming	836,962	467,382	1,304,344	834,487	457,258	1,291,745	852,212
Other	0	204,400	204,400	0	204,400	204,400	0
SUBTOTAL	112,687,376	35,720,159	148,407,535	113,158,917	35,402,531	148,561,448	115,638,174
Regional Res. Undistributed	0	0	0	0	197,400 (a)	197,400	36,460,784 (a)
Federal Admin.	0	0	4,410,309		0	4,416,129	4,520,739
Unoblig. Bal..	817,798	0	838,228	0	0	0	0
Small Bus. Act	1,436,774	452,154	1,888,928	1,432,391	450,632	1,883,023	1,925,303
TOTAL	114,941,948	36,172,313	155,545,000	114,591,308	36,050,563	155,058,000	158,545,000

(a) Funds will be distributed at a later date by a statutory committee authorized in the Hatch Act.

Table 3
Distribution of Funds under the McIntire-Stennis Cooperative
Forestry Research Act
(In Dollars)

State/Recipient	Fiscal Year 1989 Actual	Fiscal Year 1990 Estimate	Fiscal Year 1991 Estimate
ALABAMA			
Agricultural Experiment Station, Auburn University	$569,443	$560,009	$415,455
ALASKA			
Agricultural Experiment Station, University of Alaska	351,541	345,880	259,148
AMERICAN SAMOA			
American Samoa Community College	0	0	0
ARIZONA			
Agricultural Experiment Station, University of Arizona	121,295	119,408	90,497
School of Forestry, Northern Arizona University	121,295	119,408	90,497
ARKANSAS			
Agricultural Experiment Station, Univ. of Arkansas	482,282	474,358	352,932
CALIFORNIA			
Agricultural Experiment Station, Univ. of California	420,690	413,747	19,210
Department of Forestry, California State Univ., Humboldt	78,879	77,578	57,629
California Polytechnic State University	26,293	25,859	307,355
COLORADO			
College of Forestry and Natural Resources, Colorado State Univ.	286,170	281,642	212,256
CONNECTICUT			
Agricultural Experiment Station, New Haven	141,086	138,963	106,438
Agricultural Experiment Station, Univ. of Connecticut, Storrs .	47,029	46,321	35,479
DELAWARE			
Agricultural Experiment Station, University of Delaware	100,953	88,926	71,580
FLORIDA			
Agricultural Experiment Station, University of Florida	471,387	463,651	345,117
GEORGIA			
School of Forest Resources, University of Georgia	580,338	581,422	431,085
GUAM			
Agricultural Experiment Station, University of Guam	0	0	0
HAWAII			
Agricultural Experiment Station, University of Hawaii	122,744	131,752	102,841
IDAHO			
College of Forestry, University of Idaho	384,226	378,000	282,594
ILLINOIS			
Agricultural Experiment Station, University of Illinois	126,742	140,821	106,128
Department of Forestry, Southern Illinois University	126,742	140,821	106,128
INDIANA			
Agricultural Experiment Station, Purdue University	307,961	292,348	220,071
IOWA			
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	155,429	163,871	126,287
KANSAS			
Agricultural Experiment Station, Kansas State University	166,324	153,165	118,472
KENTUCKY			
Agricultural Experiment Station, University of Kentucky	362,436	367,295	274,778
LOUISIANA			
Agricultural Experiment Station, Louisiana State University ...	352,851	339,545	252,523
School of Forestry, Louisiana Tech University	151,222	145,519	108,224
MAINE			
Agricultural Experiment Station, University of Maine	498,178	495,771	368,563
MARYLAND			
Agricultural Experiment Station, University of Maryland	209,905	228,110	173,179
MASSACHUSETTS			
Agricultural Experiment Station, University of Massachusetts ..	231,695	206,697	157,548
MICHIGAN			
Agricultural Experiment Station, Michigan State University	171,656	168,826	125,459
School of Natural Resources, University of Michigan	171,656	168,826	125,459
Department of Forestry, Michigan Technological University	171,656	168,826	125,459
MICRONESIA			
College of Micronesia	0	0	0

State/Recipient	1989 Actual	1990 Estimate	1991 Estimate
MINNESOTA			
Agricultural Experiment Station, University of Minnesota	$416,912	$410,119	$306,040
MISSISSIPPI			
School of Forest Resources, Mississippi State University	558,548	549,303	407,639
MISSOURI			
Agricultural Experiment Station, University of Missouri	340,646	335,174	251,332
MONTANA			
School of Forestry, University of Montana	373,331	356,587	266,963
NEBRASKA			
Agricultural Experiment Station, University of Nebraska	133,639	121,045	95,026
NEVADA			
Agricultural Experiment Station, University of Nevada	57,373	56,807	48,134
NEW HAMPSHIRE			
Agricultural Experiment Station, University of New Hampshire ..	275,275	260,229	196,625
NEW JERSEY			
Agricultural Experiment Station, Rutgers University	177,219	174,578	134,102
NEW MEXICO			
Agricultural Experiment Station, New Mexico State University ..	220,800	217,403	165,364
NEW YORK			
Agricultural Experiment Station, Cornell University	123,294	129,296	96,048
College of Environmental Science and Forestry, State University of New York	369,883	387,888	288,145
NORTH CAROLINA			
School of Forest Resources, North Carolina State University ...	547,653	527,890	392,009
NORTH DAKOTA			
Agricultural Experiment Station, North Dakota State University	68,268	78,220	63,764
OHIO			
Agricultural Experiment Station, Ohio State University	318,856	313,761	235,702
OKLAHOMA			
Agricultural Experiment Station, Oklahoma State University ...	297,065	270,935	204,440
OREGON			
School of Forestry, Oregon State University	602,129	592,128	438,901
PENNSYLVANIA			
Agricultural Experiment Station, Pennsylvania State University	406,017	399,413	298,224
PUERTO RICO			
Agricultural Experiment Station, University of Puerto Rico	79,163	67,513	55,949
RHODE ISLAND			
Agricultural Experiment Station, University of Rhode Island ...	90,058	99,633	79,395
SOUTH CAROLINA			
College of Forest and Recreation Resources, Clemson University	449,597	431,532	321,671
SOUTH DAKOTA			
Agricultural Experiment Station, South Dakota State University	111,848	110,339	87,210
TENNESSEE			
Agricultural Experiment Station, University of Tennessee	395,121	388,706	290,409
TEXAS			
Agricultural Experiment Station, Texas A&M University	219,351	221,119	164,743
School of Forestry, Stephen F. Austin State University	219,351	221,119	164,743
UTAH			
College of Natural Resources, Utah State University	144,534	142,458	110,656
VERMONT			
School of Natural Resources, University of Vermont	264,380	249,523	188,810
VIRGIN ISLANDS			
Agricultural Experiment Station, Univ. of the Virgin Islands ..	0	46,097	40,318
VIRGINIA			
School of Forestry and Wildlife Resources, Virginia Polytechnic Institute and State University	460,492	452,945	337,301
WASHINGTON			
Agricultural Experiment Station, Washington State University ..	266,055	256,822	232,798
College of Forest Resources, University of Washington	325,178	313,894	190,471
WEST VIRGINIA			
Agricultural Experiment Station, West Virginia University	329,751	324,468	243,517
WISCONSIN			
Agricultural Experiment Station, University of Wisconsin	427,807	420,825	313,855
WYOMING			
Agricultural Experiment Station, University of Wyoming	188,114	195,990	149,733
Subtotal	16,762,812	16,551,122	12,428,428
Federal administration (3%)	525,000	518,370	389,250
Small Business Act	212,188	209,508	157,322
Total	17,500,000	17,279,000	12,975,000

Table 4

Evans-Allen Payments to 1890 Colleges and Tuskegee University Under Section 1445, Public Law 95-113, As Amended (In Dollars)

	Fiscal Year 1989 Actual	Fiscal Year 1990 Estimate	Fiscal Year 1991 Estimate
ALABAMA			
Alabama A&M University	$1,381,173	$1,414,690	$1,471,800
Tuskegee University	1,361,743	1,395,260	1,452,371
ARKANSAS			
University of Arkansas--Pine Bluff..	1,202,039	1,233,643	1,287,496
DELAWARE			
Delaware State College	472,233	482,835	500,900
FLORIDA			
Florida A&M University	965,735	995,464	1,046,122
GEORGIA			
Fort Valley State College	1,513,303	1,555,740	1,628,051
KENTUCKY			
Kentucky State University	1,720,917	1,776,048	1,869,988
LOUISIANA			
Southern University	1,098,367	1,126,042	1,173,198
MARYLAND			
University of Maryland-Eastern Shore	803,585	824,806	860,967
MISSISSIPPI			
Alcorn State University	1,420,528	1,451,462	1,504,174
MISSOURI			
Lincoln University	1,617,000	1,674,491	1,772,452
NORTH CAROLINA			
North Carolina A&T State University.	2,184,915	2,245,367	2,348,372
OKLAHOMA			
Langston University	1,099,504	1,132,707	1,189,284
SOUTH CAROLINA			
South Carolina State College........	1,194,949	1,223,071	1,270,991
TENNESSEE			
Tennessee State University	1,659,999	1,706,848	1,786,677
TEXAS			
Prairie View A&M College	2,143,675	2,212,430	2,329,586
VIRGINIA			
Virginia State College	1,432,207	1,471,365	1,538,102
CRIS	36,100	36,100	36,100
Subtotal	23,307,972	23,958,369	25,066,631
Federal Administration (3%)	729,990	750,360	785,070
Small Business Act	295,038	303,271	317,299
TOTAL	24,333,000	25,012,000	26,169,000

Table 5
Distribution of Funds for Animal Health and Disease Research
Section 1433, P.L. 95-113
(In Dollars)

State/Recipient	Fiscal Year 1989 Actual	Fiscal Year 1990 Est.
ALABAMA		
Agricultural Experiment Station, Auburn University	$59,229	$51,862
School of Veterinary Medicine, Auburn University	46,277	51,578
School of Veterinary Medicine, Tuskegee University	5,220	6,241
ALASKA		
Agricultural Experiment Station, University of Alaska	11,937	8,316
ARIZONA		
Agricultural Experiment Station, University of Arizona	59,201	56,856
ARKANSAS		
Agricultural Experiment Station, University of Arkansas	73,641	79,070
CALIFORNIA		
Agricultural Experiment Station, Univ. of California, Berkeley.	226,815	225,008
School of Veterinary Medicine, University of California, Davis.	158,598	144,757
COLORADO		
Agricultural Experiment Station and College of Veterinary Medicine, Colorado State University	241,605	232,005
CONNECTICUT		
Agricultural Experiment Station, Univ. of Connecticut, Storrs .	22,604	21,712
DELAWARE		
Agricultural Experiment Station, University of Delaware	18,703	19,086
FLORIDA		
Agricultural Experiment Station, University of Florida	82,451	73,910
College of Veterinary Medicine, University of Florida	84,503	90,951
GEORGIA		
Agricultural Experiment Station, University of Georgia	21,133	22,819
College of Veterinary Medicine, University of Georgia	118,666	117,567
HAWAII		
Agricultural Experiment Station, University of Hawaii	7,992	7,694
IDAHO		
Agricultural Experiment Station, University of Idaho	44,042	42,004
College of Veterinary Medicine, University of Idaho	23,398	15,967
ILLINOIS		
Agricultural Experiment Station and College of Veterinary Medicine, University of Illinois	163,163	148,954
INDIANA		
Agricultural Experiment Station and School of Veterinary Medicine, Purdue University	100,047	99,442
IOWA		
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	48,065	47,288
College of Veterinary Medicine, Iowa State University	227,293	217,034
KANSAS		
Agricultural Experiment Station and College of Veterinary Medicine, Kansas State University	169,149	174,726
KENTUCKY		
Agricultural Experiment Station, University of Kentucky	90,699	88,571
LOUISIANA		
Agricultural Experiment Station, Louisiana State University ...	62,751	61,544
School of Veterinary Medicine, Louisiana State University	27,177	32,503
MAINE		
Agricultural Experiment Station, University of Maine	16,254	16,114
MARYLAND		
Agricultural Experiment Station, University of Maryland	45,714	42,936
MASSACHUSETTS		
Agricultural Experiment Station, University of Massachusetts ..	13,792	12,038
School of Veterinary Medicine, Tufts University	28,419	18,420
MICHIGAN		
Agricultural Experiment Station and College of Veterinary .Medicine, Michigan State University	97,935	96,709
MINNESOTA		
Agricultural Experiment Station, University of Minnesota	87,540	85,055
College of Veterinary Medicine, University of Minnesota	83,945	84,181
MISSISSIPPI		
Agricultural and Forestry Experiment Station and College of Veterinary Medicine, Mississippi State University	69,522	74,655

State/Recipient	Fiscal Year 1989 Actual	Fiscal Year 1990 Est.
MISSOURI		
Agricultural Experiment Station, University of Missouri	$44,426	$51,008
College of Veterinary Medicine, University of Missouri	126,797	110,185
MONTANA		
Agricultural Experiment Station, Montana State University	79,449	71,819
NEBRASKA		
Agricultural Experiment Station, University of Nebraska	177,438	174,905
NEVADA		
Agricultural Experiment Station, University of Nevada	23,276	24,042
NEW HAMPSHIRE		
Agricultural Experiment Station, University of New Hampshire	9,698	9,907
NEW JERSEY		
Agricultural Experiment Station, Rutgers University	21,747	25,138
NEW MEXICO		
Agricultural Experiment Station, New Mexico State University	38,618	38,248
NEW YORK		
Agricultural Experiment Station, Cornell University	70,579	72,277
College of Veterinary Medicine, Cornell University	226,462	224,742
NORTH CAROLINA		
Agricultural Experiment Station and School of Veterinary Medicine, North Carolina State University	111,112	116,107
NORTH DAKOTA		
Agricultural Experiment Station, North Dakota State University	55,690	54,307
OHIO		
Ohio Agricultural Research and Dev. Center, Ohio State Univ.	82,326	84,923
College of Veterinary Medicine, Ohio State University	29,447	27,842
OKLAHOMA		
Agricultural Experiment Station and College of Veterinary Medicine, Oklahoma State University	109,810	113,621
OREGON		
Agricultural Experiment Station, Oregon State University	55,257	62,027
School of Veterinary Medicine, Oregon State University	36,832	28,252
PENNSYLVANIA		
Agricultural Experiment Station, Pennsylvania State Univ.	68,435	67,229
School of Veterinary Medicine, University of Pennsylvania	79,150	81,048
PUERTO RICO		
Agricultural Experiment Station, University of Puerto Rico	12,385	12,925
RHODE ISLAND		
Agricultural Experiment Station, University of Rhode Island	6,599	7,361
SOUTH CAROLINA		
Agricultural Experiment Station, Clemson University	21,600	22,168
SOUTH DAKOTA		
Agricultural Experiment Station, South Dakota State University	89,816	91,275
TENNESSEE		
Agricultural Experiment Station and College of Veterinary Medicine, University of Tennessee	66,245	66,684
TEXAS		
Agricultural Experiment Station and College of Veterinary Medicine, Texas A&M University	367,752	374,727
UTAH		
Agricultural Experiment Station, Utah State University	45,277	44,946
VERMONT		
Agricultural Experiment Station, University of Vermont	17,627	16,798
VIRGINIA		
Agricultural Experiment Station and College of Veterinary Medicine, Virginia Polytechnic Institute and State Univ.	98,668	108,138
WASHINGTON		
Agricultural Experiment Station, Washington State Univ.	41,618	40,915
College of Veterinary Medicine, Washington State Univ.	91,277	96,656
WEST VIRGINIA		
Agricultural & Forestry Experiment Station, West Virginia Univ.	12,579	11,933
WISCONSIN		
Agricultural Experiment Station and College of Veterinary Medicine, University of Wisconsin	192,830	184,186
WYOMING		
Agricultural Experiment Station, University of Wyoming	42,946	41,924
Subtotal	5,191,248	5,125,836
Federal administration	219,040	216,280
Small Business Act	65,712	64,884
Total	5,476,000	5,407,000

Table 6
Competitive Research Grants
Proposals Submitted and Grants Awarded in Fiscal Year 1989

	Proposals Received	Dollars Requested	Grants Awarded	Dollars Awarded
Plant Science				
Biological Stress	136	$27,263,620	37	$2,789,500
Genetic Mechanisms	31	8,465,800	11	1,141,000
Nitrogen Fixation	47	9,783,133	18	1,482,957
Photosynthesis	44	9,226,361	14	1,215,907
Soybeans	54	11,165,590	6	467,364
Alcohol Fuels	27	5,927,799	5	487,272
Subtotal	339	71,832,303	91	7,584,000
Human Nutrition				
Nutrient Requirements	64	15,372,750	11	948,000
Animal Science				
Brucellosis	9	2,349,069	2	450,300
Reproductive Research	132	32,363,176	29	5,237,700
Subtotal	141	34,712,245	31	5,688,000
Biotechnology				
Plant Growth and Development	123	30,660,950	22	2,900,000
Plant Molecular Biology	152	36,908,673	45	4,349,168
Plant Science General	1	500,000	1	300,000 (a)
Responses to Biological Stress	155	30,744,082	42	3,600,500
Responses to Physical Stress (plants)	86	18,687,361	23	1,775,000
Animal Growth and Development	87	22,058,024	12	2,102,500
Animal Molecular Biology	132	37,475,526	15	3,000,000
Subtotal	736	177,034,616	160	18,027,168
Pest Science				
Gypsy Moth, Pine Bark Beetle, Boll Weevil/Bollworm	71	13,052,264	19	1,896,000
Stratospheric Ozone Depletion	69	20,816,299	22	3,507,600
TOTAL	1,420	332,820,477	334	37,550,768

	Proposals Received	Dollars Requested	Grants Awarded	Dollars Awarded
1862 Land-Grant Universities	966	$219,748,878	245	$27,266,558
1890 Land-Grant Universities	7	1,342,194	1	100,000
Private Universities	75	20,505,345	16	2,013,222
Other Public Universities	155	39,656,515	27	3,113,127
Federal Laboratories	7	2,435,736	3	493,000
USDA/ARS/FS	77	16,104,098	24	2,652,861
Private Non-Profit	45	13,942,018	7	560,000
Private Profit	3	312,107	1	100,000
State and Local Agencies	- -	- -	- -	- -
Veterinary Schools & Colleges	63	17,075,051	7	1,193,000
Other	22	1,698,535	3	159,000
TOTAL	1,420	332,820,477	334	37,650,768

(a) Excludes $200,000 awarded from the administrative set-aside of Competitive Research Grants program funds.

Table 7
Competitive Research Grants
Fiscal Year 1989 Recipients
(In Dollars)

State/Recipient	Fiscal Year 1989 Actual
ALABAMA	
Tuskegee University	100,000
ARIZONA	
Agricultural Experiment Station, University of Arizona	1,354,000
ARKANSAS	
Agricultural Experiment Station, Univ. of Arkansas	200,000
CALIFORNIA	
J. N. Bailey-Serres	33,000
Agricultural Experiment Station, Univ. of California, Berkeley	1,117,688
University of California, Davis	1,887,712
University of California, Irvine	240,000
University of California, San Diego	270,000
University of California, Los Angeles	150,000
University of California, Riverside	595,000
University of California, Santa Barbara	180,000
Salk Institute for Biological Studies	90,000
Stanford University	560,000
USDA-Agricultural Research Service	280,000
COLORADO	
Agricultural Experiment Station, Colorado State University	234,000
USDA-Agricultural Research Service	150,000
CONNECTICUT	
Agricultural Experiment Station, Univ. of Connecticut, Storrs	90,000
DISTRICT OF COLUMBIA	
Carnegie Institution of Washington	100,000
Delaware	
E.I. du Pont de Nemours Co., Inc.	100,000
Agricultural Experiment Station, University of Delaware	100,000
FLORIDA	
Agricultural Experiment Station, University of Florida	1,524,000
Tampa Bay Research Institute	220,000
GEORGIA	
Agricultural Experiment Station, University of Georgia	470,000
USDA-Agricultural Research Service	530,000
ILLINOIS	
Agricultural Experiment Station, University of Illinois	1,072,000
Illinois State University	60,000
Southern Illinois University	305,000
University of Illinois, Champaign	280,000
Northwestern University	60,000
University of Chicago	197,000
USDA-Agricultural Research Service	461,000
INDIANA	
Agricultural Experiment Station, Purdue University	1,165,257
IOWA	
Agriculture & Home Economics Experiment Sta., Iowa State Univ.	880,000
University of Iowa	100,000
KANSAS	
Agricultural Experiment Station, Kansas State University	440,000
KENTUCKY	
Agricultural Experiment Station, University of Kentucky	645,000
Randy Hunt	66,000
LOUISIANA	
Agricultural Experiment Station, Louisiana State University	100,000
Louisiana State University Medical Center	272,334
USDA-Forest Service	100,000
MAINE	
Agricultural Experiment Station, University of Maine	120,000

State/Recipient	Fiscal Year 1989 Actual
MARYLAND	
Agricultural Experiment Station, University of Maryland	660,000
USDA-Agricultural Research Service	787,000
MASSACHUSETTS	
Agricultural Experiment Station, University of Massachusetts ..	413,898
Amherst College	100,000
MICHIGAN	
Agricultural Experiment Station, Michigan State University	1,047,410
University of Michigan	352,000
MINNESOTA	
Agricultural Experiment Station, University of Minnesota	836,442
MISSOURI	
Agricultural Experiment Station, University of Missouri	750,012
Jeffrey A. Hall	60,000
Northeast Missouri State University	65,000
Washington University	150,000
MONTANA	
Agricultural Experiment Station, Montana State University	158,000
NEBRASKA	
Agricultural Experiment Station, University of Nebraska	648,545
NEVADA	
Agricultural Experiment Station, University of Nevada	323,000
NEW HAMPSHIRE	
Dartmouth College	100,000
NEW JERSEY	
Agricultural Experiment Station, Rutgers University	343,000
University of Medicine and Dentistry of New Jersey	215,000
NEW YORK	
Agricultural Experiment Station, Cornell University	2,550,938
Boyce Thompson Institute	145,000
CUNY Research Foundation on Behalf of Baruch College	180,000
City Univ. of New York Res. Fdn. & College of Staten Island ...	65,000
Rensselaer Polytechnic Institute	125,000
Research Foundation of State University of New York	90,000
State University of New York	100,000
U.S. Department of Energy	350,000
NORTH CAROLINA	
Agricultural Experiment Station, North Carolina State University	294,000
University of North Carolina at Chapel Hill	210,000
OHIO	
Agricultural Experiment Station, Ohio State University	811,408
University of Cincinnati College of Medicine	203,000
OKLAHOMA	
Agricultural Experiment Station, Oklahoma State University	320,000
OREGON	
Agricultural Experiment Station, Oregon State University	845,157
PENNSYLVANIA	
Agricultural Experiment Station, Pennsylvania State University	643,000
Drexel University	100,000
Temple University School of Medicine	230,000
University of Pennsylvania	220,000
USDA-Agricultural Research Service	192,759
USDA-Forest Service	152,102
RHODE ISLAND	
Gordon Research Conference	5,000
SOUTH CAROLINA	
Agricultural Experiment Station, Clemson University	50,000
SOUTH DAKOTA	
Agricultural Experiment Station, South Dakota State University	100,000

State/Recipient	Fiscal Year 1989 Actual
TENNESSEE	
Agricultural Experiment Station, University of Tennessee	160,000
US Department of Energy, Oak Ridge	143,000
TEXAS	
Agricultural Experiment Station, Texas A&M University	367,500
Texas Tech University	205,205
University of Texas	50,000
University of Texas Health Science Center	75,000
University of Texas Medical Branch	135,422
William Marsh Rice University	147,272
UTAH	
Brigham Young University	128,950
Agricultural Experiment Station, Utah State University	381,050
University of Utah	120,000
VERMONT	
Agricultural Experiment Station, University of Vermont	50,000
VIRGINIA	
Agricultural Experiment Station, Virginia Polytechnic Institute and State University	60,000
WASHINGTON	
Agricultural Experiment Station, Washington State University	835,008
University of Washington	352,500
WEST VIRGINIA	
Agric. & Forestry Exper. Station, West Virginia University	180,000
WISCONSIN	
Agricultural Experiment Station, University of Wisconsin	1,944,199
Medical College of Wisconsin	345,000
WYOMING	
Agricultural Experiment Station, University of Wyoming	80,000
Subtotal	37,650,768
Federal administration (4%)	1,588,640
Small Business Act	476,592
Total	39,716,000

COOPERATIVE STATE RESEARCH SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

[Buildings and Facilities]

[For acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities and for grants to States and other eligible recipients for such purposes, as necessary to carry out the agricultural research, extension and teaching programs of the Department of Agriculture, where not otherwise provided, $45,686,000.]

This change deletes language for this account since no funding is being requested in fiscal year 1991.

COOPERATIVE STATE RESEARCH SERVICE

BUILDINGS AND FACILITIES

Appropriation Act, 1990	$45,686,000
Budget Estimate, 1991	- -
Decrease in Appropriation	-45,686,000

Adjustments in 1990:		
Appropriation Act, 1990	$45,686,000	
Gramm-Rudman-Hollings Reduction (P.L. 99-177)	-578,000	
Adjusted base for 1990		45,108,000
Budget estimate, 1991		- -
Decrease from adjusted 1990		-45,108,000

SUMMARY OF INCREASES AND DECREASES

(On basis of adjusted appropriation)

Item of Change	1990 Estimated	Pay Costs	Program Change	1991 Estimated
Buildings and Facilities, Total Available	$45,108,000	- -	-$45,108,000	- -

PROJECT STATEMENT
(On basis of adjusted appropriation)

Project	1989 Actual		1990 Estimated		Increase or Decrease	1991 Estimated	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
Buildings and Facilities:							
Ctr. for Alter. Pest Control Research, AK	- -		$420,000		-$420,000	- -	
Poultry Center of Excellence, AK	- -		(a)		- -	- -	
Poultry Laboratory & Isolation Facility, Univ. of Arkansas .	$200,000		247,000		-247,000	- -	
Rice Germplasm Ctr., Stuttgart, Arkansas	- -		(a)		- -	- -	
Grape Import. Facil. Univ. of CA., Davis	- -		128,000		-128,000	- -	
Ag. Biotech. Inst., Univ. of Florida ..	600,000		1,530,000		-1,530,000	- -	
Biocontainment Facil. Univ. of Georgia ..	467,000		985,000		-985,000	- -	
Nat. Lab. for Envir. Sound Prod. Ag., GA	- -		(a)		- -	- -	
Ctr. for Tropical & Subtropical Agric., Univ. of Hawaii ...	50,000		1,121,000		-1,121,000	- -	
Biotech. Facil., ID	- -		(a)		- -	- -	
National Soybean Lab, Univ. of Illinois .	250,000		1,306,000		-1,306,000	- -	
Molecular & Cellular Biotech. Facil., IN	- -		(a)		- -	- -	
National Ctr. for Food & Industrial Product Development, Iowa State Univ....	1,700,000		3,203,000		-3,203,000	- -	
Nutri. Research Ctr. Iowa State Univ...	290,000		2,271,000		-2,271,000	- -	
Plant Science Ctr., Kansas State Univ.	1,400,000		2,962,000		-2,962,000	- -	
Bldg. Consolidation, Univ. of Maine	- -		(a)		- -	- -	
Masardis Research Farm, Maine	- -		114,000		-114,000	- -	
Food Toxicology Ctr., Michigan State Univ.	1,250,000		2,962,000		-2,962,000	- -	
Nat. Ctr. for Devel. of Natural Products Univ. of Miss......	400,000		3,875,000		-3,875,000	- -	
Biosci. Research Lab Montana State Univ.	50,000		247,000		-247,000	- -	
Ctr for Advan. Tech. Univ. of Nebraska .	250,000		2,962,000		-2,962,000	- -	
Ctr for Ag. Molecular Biol., Rutgers Univ.	250,000		89,000		-89,000	- -	
Biotech Facil., NC ..	- -		(a)		- -	- -	
Ctr. for Nutrition, Wake Forest Univ, NC	- -		2,853,000		-2,853,000	- -	
Inst. for Earth Sys Sci., Univ. of ND	4,200,000		4,147,000		-4,147,000	- -	
Industrial Agric. & Commun. Ctr., ND State Univ......	535,000		2,304,000		-2,304,000	- -	
Hettinger Research Teaching Lab, ND ..	- -		148,000		-148,000	- -	
Plant Sci. Greenhouse Complex, ND	- -		(a)		- -	- -	

Project	1989 Actual Amount	1989 Actual Staff Years	1990 Estimated Amount	1990 Estimated Staff Years	Increase or Decrease	1991 Estimated Amount	1991 Estimated Staff Years
Nat.-Ctr. for Equine & Bovine Biotech. Research, Oklahoma State University ..	- -		$296,000		-$296,000	- -	
Agric. Research Facility, Oregon State University ..	$7,500,000		- -		- -	- -	
Bldg. Consolidation, Univ. of RI	- -		(a)		- -	- -	
No. Plains Biostress Lab., SD State Univ.	100,000		1,679,000		-1,679,000	- -	
Nursery Crop Research Station, Tennessee State University ..	- -		247,000		-247,000	- -	
Inst. of Biosciences & Technology, Texas A&M Univ. at Houston	1,250,000		2,962,000		-2,962,000	- -	
Biomed. Clinic, Univ. of Texas SW, Dallas	- -		950,000		- -	- -	
Biotech Lab, Utah University	- -		(a)		- -	- -	
Stafford-Aiken Ctr. for Microbio. & Ag. Sci., Univ. of VT .	1,400,000		- -		- -	- -	
Tree Physiology and Maple Research Lab. Univ. of Vermont ...	50,000		370,000		-370,000	- -	
Agric. Biotechnology Center, Virginia Polytechnic Inst. & State University ..	100,000		112,000		-112,000	- -	
Virginia-Maryland Regional College of Veterinary Medicine	50,000		474,000		-474,000	- -	
College of Veterinary Medicine, Animal Disease Biotech Fac. WA State Univ.......	- -		(a)		- -	- -	
Food & Nutrition Ctr. WA State Univ.......	3,405,000		2,108,000		-2,108,000	- -	
Ctr. for Info. & Tech Transfer, Gonzaga Univ., Spokane, WA	1,875,000		617,000		-617,000	- -	
Poultry Research Facil. WV Univ.....	1,888,000		1,481,000		1,481,000	- -	
Agric. Biotech & Genetics Bldg, Univ. of Wisconsin	50,000		592,000		-592,000	- -	
Reports on footnote (a) items	- -		296,000		-296,000	- -	
Carryover Balances .	90,000		170,000		-170,000	- -	
Federal Admin. (3%)	(886,800)		(1,372,860)		(-1,372,860)		
Total	29,650,000	8	46,228,000	10	-46,228,000 (1)	- -	- -
Total obligations	29,650,000	8	46,228,000	10	-46,228,000	- -	- -
Unobligated Balances:							
Available, start of year	-310,000	- -	-1,120,000	- -	+1,120,000	- -	- -
Transferred	-7,500,000	- -	- -	- -	- -	- -	- -
Available, end of year	1,120,000	- -	- -	- -	- -	- -	- -
Total available or estimate	22,960,000	8	45,108,000	10	-45,108,000	- -	- -
Gramm-Rudman-Hollings Reduction, P.L. 99-177	- -	- -	578,000	- -			
Transfer from Agricultural Research Service	-22,960,000	- -	- -	- -			
Total, Appropriation ..	- -	8	45,686,000	10			

EXPLANATION OF PROGRAM

Buildings and Facilities - In the Fiscal Year 1989 Appropriation Act, funds were appropriated to the Agricultural Research Service for Buildings and Facilities. Some of these funds were earmarked for facilities at specific universities. The appropriation language allowed for transfer of these funds to other accounts as may be appropriate and $30.5 million in 1989 was transferred to CSRS. CSRS awarded grants and cooperative agreements for these facilities to the universities.

In the Fiscal Year 1990 Appropriation Act, $45.7 million was appropriated to CSRS for Building and Facilities at designated universities. These funds are available until expended and CSRS is awarding grants for these facilities to the universities.

JUSTIFICATION OF INCREASES AND DECREASES

(1) A decrease of $46,228,000 for Buildings and Facilities ($46,228,000 available in 1990).

Need for Change. In the Fiscal Year 1989 Appropriation Act, funds were appropriated to the Agricultural Research Service for Buildings and Facilities. Funds earmarked for facilities at specific universities were transferred to CSRS in 1989 consistent with the appropriation language. Funds were carried over from 1989 to 1990 for the Biomedical Clinic at the University of Texas Southwestern ($950,000) and for Federal Administration ($170,000). In 1990, $45,108,000 has been appropriated in a separate CSRS Buildings and Facilities account.

Nature of Change. No additional funding is being proposed for these or other university facilities.

COOPERATIVE STATE RESEARCH SERVICE

Status of Construction Projects

BUILDINGS AND FACILITIES

In the Fiscal Year 1989 Appropriations Act, funds were appropriated under the Agricultural Research Service Buildings and Facilities account. The appropriation language allowed for transfer of these funds "to other accounts as may be appropriate to carry out these programs". Consequently, $30.5 million was transferred to the Cooperative State Research Service in fiscal year 1989. The status of these research facilities is as follows:

Facility	Amount	Description
University of Arkansas, Poultry Disease Research Center	$200,000	CSRS awarded a grant to the University of Arkansas for construction of the Poultry Disease Research Center.
University of Florida, Agricultural Biotechnology Institute	600,000	CSRS awarded a grant to the University of Florida for planning and construction of an Agricultural Biotechnology Institute.
University of Georgia, Biocontainment Research Center	467,000	CSRS awarded a grant to the University of Georgia for construction of a Biocontainment Research Center.
University of Hawaii, Center for Tropical and Subtropical Agriculture	50,000	CSRS awarded a cooperative agreement to the University of Hawaii to conduct a feasibility study on constructing a Center for Tropical and Subtropical Agriculture. A copy of the feasibility study was sent to the Appropriations Committees on May 3, 1989.
University of Illinois, National Soybean Research Laboratory	250,000	CSRS awarded a grant to the University of Illinois for planning for construction of a National Soybean Research Laboratory.
Iowa State University, National Center for Food and Industrial Agricultural Product Development	1,700,000	CSRS awarded a grant to Iowa State University for construction of a National Center for Food and Industrial Agricultural Product Development.
Iowa State University, Center for Human Nutrition, Food Selection and Supply	290,000	CSRS awarded a grant to Iowa State University for planning for construction of a Center for Human Nutrition, Food Selection and Supply.
Kansas State University, Plant Science Facility	1,400,000	CSRS awarded a grant to Kansas State University for construction of a Plant Science Facility.

Michigan State University Food Toxicology Laboratory	1,250,000	CSRS awarded a grant to Michigan State University for planning for construction of a Food Toxicology Laboratory.
University of Mississippi, Center for the Technological Development of Natural Products	400,000	CSRS awarded a grant to the University of Mississippi for planning for construction of a Center for the Technological Development of Natural Products.
Montana State University, Bioscience Research Laboratory	50,000	CSRS awarded a cooperative agreement to Montana State University to conduct a feasibility study on constructing a Bioscience Research Laboratory. A copy of the feasibility study was sent to the Appropriations Committees on May 3, 1989.
University of Nebraska National Center for Advanced Technology	250,000	CSRS awarded a grant to the University of Nebraska for planning for construction of a National Center for Advanced Technology.
Rutgers University, Plant Bioscience and Biotechnology Complex	250,000	CSRS awarded a grant to Rutgers University for planning for construction of a Plant Bioscience and Biotechnology Complex.
North Dakota State University, Industrial Agriculture and Communications Center	535,000	CSRS awarded a grant to North Dakota State University for a feasibility study and for planning for construction of an Industrial Agriculture and Communications Center.
University of North Dakota, Institute for Earth Systems Science	4,200,000	CSRS awarded a grant to the University of North Dakota for planning and construction of an Institute for Earth Systems Science.
Oregon State University, Agricultural Sciences II Building	7,500,000	CSRS awarded a grant to Oregon State University for construction of an Agricultural Sciences II Building.
South Dakota State University, Northern Plains Biostress Laboratory	100,000	CSRS awarded to South Dakota State University a cooperative agreement for a feasibility study and a grant for planning for construction of a Northern Plains Biostress Laboratory. A copy of the feasibility study was sent to the Appropriations Committees on May 3, 1989.
Texas A&M University System, Institute of Biosciences and Technology	1,250,000	CSRS awarded a grant to Texas A&M University System for construction of an Institute of Biosciences and Technology.

University of Texas Southwestern, Biomedical Clinic	950,000	A copy of the feasibility study was sent to the Appropriations Committees on July 18, 1989. No funds have been obligated for this project.
University of Vermont, Stafford-Aiken Center for Microbiology and Agricultural Sciences	1,400,000	CSRS awarded a grant to the University of Vermont for construction of the Stafford-Aiken Center for Microbiology and Agricultural Sciences.
University of Vermont, Maple Research Laboratory	50,000	CSRS awarded a cooperative agreement to the University of Vermont to conduct a feasibility study on constructing a Maple Research Laboratory. A copy of the feasibility study was sent to the Appropriations Committees on July 13, 1989.
Virginia Polytechnic Institute and State University, Virginia-Maryland Research College of Veterinary Medicine	50,000	CSRS awarded a cooperative agreement to Virginia Polytechnic Institute and State University to conduct a feasibility study on proposed modifications to the research facilities at the Virginia-Maryland Regional College of Veterinary Medicine. A copy of the feasibility study was sent to the Appropriations Committees on May 3, 1989.
Virginia Polytechnic Institute and State University, Agricultural Biotechnology Center	100,000	CSRS awarded a grant to Virginia Polytechnic Institute and State University for planning for construction of an Agricultural Biotechnology Center.
Washington State University, Food-Human Nutrition Center	3,405,000	CSRS awarded a grant to Washington State University for construction of a Food-Human Nutrition Center.
Gonzaga University, Spokane, Washington, Center for Information and Technology	1,875,000	CSRS awarded a grant to Gonzaga University for construction of a Center for Information and Technology.
West Virginia University, Poultry Research Facility	1,888,000	CSRS awarded a grant to West Virginia University for construction of a Poultry Research Facility.
University of Wisconsin, Agricultural Biotechnology and Genetics Building	50,000	CSRS awarded a cooperative agreement to the University of Wisconsin to conduct a feasibility study on construction of an Agricultural Biotechnology and Genetics Building. A copy of the feasibility study was sent to the Appropriations Committees on July 13, 1989.

COOPERATIVE STATE RESEARCH SERVICE

STATUS OF PROGRAM

Current activities, progress, and current programs under each project are outlined below:

PAYMENTS UNDER THE HATCH ACT

The Hatch program of research at the State Agricultural Experiment Stations is aimed at promoting efficient production, marketing, distribution, and utilization of crops and livestock essential to the food supply or health and welfare of the people of the United States, conserving resources, and improving rural living conditions. This program indirectly supports development of agricultural expertise by providing training opportunities for students to assist in the research projects being conducted by scientists at the State Agricultural Experiment Stations.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

1. FOREST AND NATURAL RESOURCES

Current Activities: Twelve percent of total Hatch funds for research. Included are forestry, soil and land use, water and watersheds, outdoor recreation, environmental quality, fish and wildlife, and remote sensing. Forestry related research under the Hatch Act is closely coordinated with the McIntire-Stennis Cooperative Forestry Research program which has similar research objectives. The Hatch forestry research program is characterized by a high degree of multi-institutional or regional projects.

Selected Examples of Recent Progress:

On-Site Sewage Treatment. A project in Tennessee is developing and evaluating a prototype on-site wastewater renovation system that removes nitrogen, a cause of groundwater deterioration, and eliminates soil depth as a criterion for determining site suitability for such systems. The prototype system promises to deliver numerous economic and environmental benefits for mid-South states where nearly 40 percent of the residents are served by backyard domestic wastewater renovation systems. Researchers determined that circulating septic tank effluent four times through a fixed-film biological reactor will remove 80 percent of the nitrogen. The process also removed more than 90 percent of the organic material and more than 97 percent of the fecal coliform bacteria from the wastewater. By removing large amounts of nitrogen and eliminating the soil depth criterion for wastewater renovation, areas with limited soil resources can be used for residential development leaving intact soils well suited for agricultural production. The project also demonstrated the feasibility of irrigating a lawn with renovated septic tank effluent using a pop-up lawn sprinkler.

Legumes and Conservation Tillage: Key Components of Sustainable Agriculture. In Georgia researchers have determined that legumes and conservation tillage can contribute to a sustainable agriculture by influencing soil properties, nitrogen cycling, and environmental quality. The highly mechanized grain crop production in the United States requires little labor, but is dependent on fossil fuels and intensive fertilizer and pesticide use. Researchers have determined that a well-adapted winter legume cover crop such as crimson clover or hairy vetch can replace about 100 pounds of fertilizer nitrogen per acre. This amount generally would be all of the recommended fertilizer nitrogen needed for grain sorghum or cotton production and more than half the recommended amount for corn. This means the use of legume cover crops in conjunction with conservation tillage can play a key role in significantly reducing the fertilizer nitrogen requirement of non-leguminous grain crops as well as reducing the fossil fuel requirement. The production of nitrogen fertilizer is heavily dependent on fossil fuels.

New Tools for Predicting and Controlling Agricultural Run-off. The development of computer models in *North Carolina* to simulate and successfully predict the effects of *agricultural* water management practices on soil water conditions and crop yields has kept more than a million pounds of nitrogen a year for the past six years from running into North Carolina's environmentally sensitive rivers, lakes and streams. About 40 percent of the land in North Carolina and 25 percent of the land in the United States needs improved drainage for successful agricultural production. But these highly productive lands often are located near environmentally sensitive bodies of water. The North Carolina computer models can be used in combination with other models and field experiment results to develop controlled drainage systems that will reduce the flow of nutrients into these bodies of water. Materials have been developed for use by producers in managing water drainage. The success of this project has prompted the neighboring states of *Virginia*, *Delaware*, and *Maryland* to provide cost sharing money for water management control structures. In addition, research has shown that controlled drainage systems can increase production. Corn yields have been increased by five to ten percent on the average with some years showing a 20 percent increase. Current research is focusing on developing fertility and pesticide practices to be used in combination with water management practices to further reduce pollutant loading and increase profits by lowering production costs. The spill over benefit to consumers is increased food supplies and lower prices.

The Protection and Sustainability of Agriculture. Research results in *Washington* indicate that an organic farming system is more effective than a conventional farming system in reducing soil erosion and in maintaining soil productivity. Researchers used two farms of comparable size in the Palouse region of eastern Washington State. Since it was first plowed in 1909, one farm has relied upon green manure crops, crop rotations and native soil fertility for plant nutrients. The adjoining farm, first cultivated in 1908, became conventional by receiving recommended rates of fertilizers and pesticides in 1948 and the early 1950's. An area was located at the juncture of the two adjoining farms for study. The soil in this area is made up of one type called Naff silt loam. Researchers assumed that until 1948 all environmental conditions and soil properties were similar. In 1985, when the soil was analyzed any differences in soil properties between the two farms were assumed to be due to the fact that one farm was organically managed and the other conventionally managed since 1948. Excessive erosion rates were found on the conventionally managed farm while the organically managed farm had water erosion rates of less than three-quarters of the maximum tolerance value. The difference most likely is due to the difference in crop rotation. In addition, the organically managed farm had almost 60 percent higher surface soil organic matter, a condition that encourages granulation, increases water storage, nutrient supply, and soil organism activity as well as improves soil fertility and productivity. Yields on the organic farm were similar to those on the other farms in the region.

Cheaper Strandboard. Scientists at the University of *Minnesota* have designed oriented strandboard that facilitates more efficient use of available wood. One of the costly aspects of converting trees to products is that trees grow in mixtures that do not necessarily fit the production process. For example aspen, a desirable wood for board production, often grows in mixture with paper birch. Minnesota scientists have designed boards that permit the use of paper birch for the core of aspen board. In a related development, the same research team has designed a board that uses red pine thinning as a core that has the desirable features of the aspen product. Both developments offer substantial opportunities for cost reduction in the production of strandboard.

2. CROP RESOURCES

Current Activities: Forty-one percent of total Hatch funds for research. Included under the research program grouping are crop protection and production systems for dependable and efficient production, quality improvement, quality maintenance, product development, and related commodity aspects of marketing of crops.

Selected Examples of Recent Progress:

Development of Spinach Resistant to Green Peach Aphid. In recent years, the green peach aphid has been attacking spinach crops in Arkansas, Oklahoma, and Texas causing processors to reject large numbers of crops. Limited profit potential and public concern over chemical residues on food crops means new insecticide development for use on minor acreage crops such as spinach is limited. Scientists in Arkansas and Texas are turning to traditional breeding methods to produce a spinach cultivar that will resist aphids, maintain that disease resistance and still have desirable horticultural characteristics.

Tobacco Pest Management. With insect pests causing more than $9.1 million in damage, crop loss and control cost, Georgia scientists are looking at a variety of pest management practices they hope will reduce pesticide use, provide a safer environment in which to work and lower production costs. Breeding lines are being screened for resistance to certain pests. Insect population and damage ratings are being investigated under different transplant dates. The level at which certain pests can be tolerated and a profitable crop can be delivered is being determined.

Spring Wheat Breeding, Genetics and Production. The enhanced yield of Hard Red Winter Wheat in North Dakota, yield stability and high breadmaking qualities mean a more consistent supply of wheat for export. Scientists noted that yield from the new varieties showed a nearly 30 percent improvement over the variety that dominated the acreages 20 years ago. This marked improvement in yield remained nearly equal under both favorable growing conditions and drought situations. The result has been a consistent and reduced cost of wheat for bread products, an economic boost for the state due to the value added to Hard Red Spring Wheat and lower production costs.

Developing Efficient Preventive and Suppressive Control Tactics For Integrated Pest Management in Multiple Cropping Systems. Supporting the philosophies of low input, sustainable agriculture systems, Georgia researchers are adding insect resistance to high yielding soybeans cultivars which already resist multiple pests. They also are using cultural practices that have control value for both insect and nematode pests. This approach is highly cost effective and protects the environment from additional pesticide use.

3. ANIMAL RESOURCES

Current Activities: Twenty-seven percent of total Hatch funds for research. Included under this research program grouping are protection, production, and management of beef and dairy cattle, swine, sheep, other animals, poultry, and aquaculture. It also includes quality improvement, product development, and related commodity aspects of marketing.

Selected Examples of Recent Progress:

Nutrition and Management of Swine for Increased Efficiency. A series of experiments have been conducted at North Carolina State University to determine the impact of using a growth hormone releasing factor in swine. The growth hormone releasing factor is a small compound that is produced in the brain and stimulates the natural production and secretion of growth hormones by the pituitary gland. It can be produced synthetically. Studies showed that use of the growth hormone releasing factor resulted in a 14 percent increase in growth rate and a 24 percent improvement in feed efficiency of growing pigs. In addition, carcass quality was improved. There was a 12 percent reduction in backfat and a 13 percent increase in the size of loin muscle. Carcass muscle was increased by seven percent. Total muscle in the carcass was used as an indicator of saleable product yield. Enhanced quality of carcass by the reduction of fat and increased production of lean meat should improve the marketablility of pork products in today's health conscious environment.

Beef Cattle Integrated Resource Management Program. The competitiveness and profitability of Colorado beef production has been enhanced by integrated resource management. The average net ranch income per cow on an accrual basis for six participating ranches increased from $28.52 in 1985 to $246.34 in 1987. Favorable cattle prices accounted for only part of that increase. But in most cases annual cow costs were decreased while production was maintained or increased. To provide assistance to a greater number of producers, a "cluster" integrated resource management program is being developed in which the first ranches in the program will serve as a focus for expanding the information and applications to other ranches. The results of this effort are spirit of cooperativeness and team work among local ranchers and experts, a competitively priced, healthy, nutrient dense product and a healthy rural economy.

Electronic Evaluation of Pork Carcass Quality. In Indiana, researchers have developed an instrument that assesses the fat percentage of hog carcasses in a few seconds. Applicable to both individual cuts and whole carcasses, the technology will help pork packers provide better and more uniform quality cuts to consumers. The technology also may be useful to producers who need immediate, accurate feedback regarding animal leanness when making breeding and production decisions.

Genetic Improvement of Fish Using Biotechnology. In an effort to help make commercial fish production successful in the Midwest, Indiana researchers have succeeded in genetically manipulating fish to include an extra gene of the growth hormone. The plan is to introduce such genes into triploid sterile catfish and other commercially important species. Commercial fish production in the Midwest likely will take place in confined production systems and rapidly growing fish can be produced for less money. By using sterile fish in the production system, scientists are virtually eliminating any environmental risk that might be presented should transformed fish escape into the wild.

Cloning Mammalian Embryos by Nuclear Transplantation. A procedure for large scale production of genetically identical mammals using nuclear transplantation has been developed by Massachusetts researchers. Techniques were developed for efficiently transplanting nuclei from early embryos to unfertilized eggs in which the chromosomes had been removed. The eggs were activated to continue development. Using rabbits as laboratory models, scientists have produced off-spring with this technique. The most important benefit of cloning is its use in identifying and multiplying genetically superior farm animals. The rate of genetic progress in farm animals also could be increased. In addition, the sex of clonal lines would be known. In the beef or dairy industry, a producer could order a herd of sexed, genetically identical frozen embryos that would have predetermined and superior production capabilities. Cloned lines of animals also would provide important research benefits. Because they are more uniform than random animals, considerably fewer would be needed for experiments. Researchers also would be able to investigate the relative contribution of genetics and environment on an animal's phenotype.

4. PEOPLE, COMMUNITIES, AND INSTITUTIONS (INCLUDING RURAL DEVELOPMENT)

Current Activities: Five percent of total Hatch funds for research. Included under this research program grouping are individuals and families, living environment, communities, institutions, and services.

Selected Examples of Recent Progress:

Comparative Analyses of the Kinship Systems and Life Situations of Older Rural Adults. Researchers in North Carolina, now at level 3 in a ten-year longitudinal study to determine the quality and stability of the living conditions of "old-old" rural adults, have pinpointed the need to develop a "hub" of services for the elderly and their families. When preliminary findings were presented to state and local officials, high priority was given to the development of a new senior center and the hiring of a director. The need for regional funding of health and social-related services is also being studied using data from the research project. The project raised sensitivity to the needs of the aging at several governmental levels and pointed out the high cost of institutional care for the aging compared to cost, efficiency and desirability of home based care when adequate services are provided.

Levels of Mortality and Economic/Social Structure of Counties in the United States. This project sought to identify relationships between mortality rates for specific causes and selected economic, occupational, industrial, demographic and social structures in U.S. counties. The objective was to provide specific information on which county level health program officials could base health services expenditures and program development. Researchers in North Carolina, Louisiana, New Hampshire, Pennsylvania and Connecticut found significant associations between agricultural chemical use and age-adjusted cancer mortality rates for rural counties. The findings linked herbicides to genital, lymphatic and digestive cancer and insecticides to respiratory cancer. The study found fertilizer use was largely unrelated to cancer mortality. The study reinforced the need for precautions in application and exposure to chemicals and provided a way to monitor possible long-range effects of exposure. The study addressed a number of important caveats including causal linkages, long latency periods for cancer, and quantities and frequency of application of chemicals. The researchers noted that if factors responsible for the high and low death rates in some areas can be identified, then that information may be used to reduce mortality. The team also noted that the allocation of health care resources should be reviewed with an eye toward more emphases on health promotion and education.

5. COMPETITION, TRADE ADJUSTMENTS, PRICE, AND INCOME POLICY

Current Activities: Six percent of total Hatch funds for research. Included under this research program grouping are farm adjustments, prices and income, economic aspects of marketing, and competition.

Selected Examples of Recent Progress:

Marketing California Specialty Crops: Worldwide Competition and Restraints. This major study contributed to greater understanding of existing problems in marketing California specialty crops and ways of overcoming them. Constraints to expanding trade for particular specialty crops in interstate and international markets were identified. Factors affecting demand for these crops in this nation and in the lesser developed, the middle-income, the centrally planned, and industrialized countries of the world were evaluated. California researchers analyzed the nature of interregional and international competition and investigated the potential for expanding trade via new product development. The delivery and transportation system was evaluated and ways to relieve existing constraints to marketing quality products nationally and internationally were identified. They also studied other factors involved in presenting safe, quality products.

Implications of Policies to Balance National Milk Production and Consumption for Northeast Dairy Industry. Researchers from state and Federal laboratories joined forces to develop a computer model (NEDSS - The Northeast Dairy Sector Simulator) to evaluate the impact of selected policies and changes in technology on dairy industry performance in the Northeast. Among the policy alternatives examined were the potential milk supply changes induced by use of bovine growth hormone, changes in federal milk marketing order class I prices and alternative dairy price support programs. The model is now being used nationally to evaluate the impact of various policies on different regions. Researchers have identified the strengths of alternative dairy policies, changes in consumer demand for dairy products and examined the dairy industry for improving the balance between production and consumption. The efficiency and survivability of dairy farms under alternative dairy policies were examined.

6. FOOD SCIENCE AND HUMAN NUTRITION

Current Activities: Five percent of total Hatch funds for research. Included under this research program grouping are human nutrition, food processing, food safety, food service, and food storage, distribution, and marketing.

Selected Examples of Recent Progress:

Development of New Processes and Technologies for the Processing of Poultry Products. Using supercritical carbon dioxide extracting technology, researchers in Nebraska and North Carolina have removed about two-thirds of the egg yolk cholesterol, approximately 30 percent of the lipid cholesterol and nearly 30 percent of the lipid triacylglycerols from dried egg yolk without losing desirable functional and sensory properties. The developments are important considering the nutritional completeness of eggs which contain high quality protein, vitamins and minerals and yet whose high cholesterol content is undesirable by many people.

Use of Corn Germ Protein in the Production of Meat Products. The increasing cost of conventional animal protein foods including meat, milk and egg products have led researchers to study alternative protein sources. Using plant proteins in the production of comminuted, coarse ground and other meat products is a common practice for both nutritional and cost-effectiveness reasons. The corn industry produces a significant amount of corn germ protein as a by-product and Kansas researchers have demonstrated that incorporation of the corn germ protein into meat products as a substitute for meat proteins can improve the nutritional quality and decrease fat and cholesterol content. It also can be used to improve the nutritional quality of soybean proteins. Researchers expect that a broad spectrum of new foods will be developed using corn germ protein to supplement animal proteins and fortify plant proteins. The FDA and USDA, using this research, have approved corn germ protein as an additive in meat products. The U.S. Patent Office recently awarded a patent on the process of corn germ protein utilization in meat products.

Diet and Mitochondrial Acetyl CoA Carboxylase. Weight control is the major nutritional problem in the United States and this project focuses on biochemical mechanisms involved in the synthesis of fat, particularly from dietary carbohydrate. It has long been known that the liver contains an active form of a key regulatory enzyme involved in the synthesis of fatty acids. During the course of this research, Ohio investigators discovered that the test animal's liver also contains inactive storage forms of this enzyme. During periods of decreased food intake, the active form of the enzyme is degraded so that less fat is made. Researchers have found, however, that the liver continues to accumulate the inactive storage forms of the enzyme. When caloric intake is resumed, particularly from carbohydrates, these storage forms become activated, resulting in the synthesis of more fat that would have been formed had the short-term caloric restriction not occurred. This biochemical data coincides with clinical observations others have made in humans. In addition, human liver autopsy samples contain the same storage forms of these regulatory enzymes as were found in the test animals. This research provides a biochemical basis for the observation that crash diets usually are unsuccessful. People who wish to lose weight must recognize that it is a slow process. They are likely to experience long-term success only if they continue to eat a balanced diet with a reasonably reduced caloric intake over a long period.

COOPERATIVE FORESTRY RESEARCH

The Cooperative Forestry Research (McIntire-Stennis) program provides knowledge essential to the efficient and effective use of the Nation's forest resources. Timber production, forest land management, wood utilization, and the associated development of new products, and distribution systems are the key elements of forestry research. This research also deals with the other products of the forest, i.e., wildlife, recreation, water, range, and environmental quality, whose production, management, and distribution are an inextricable part of the long term productivity and profitability of the integrated system of forest resources.

In addition, the McIntire-Stennis program has the objective of helping to create and maintain a highly qualified cadre of forest scientists through their direct involvement in the research projects as a part of their graduate education. These young men and women, educated in the sciences fundamental to forestry, will ultimately help to maintain the security and well-being of this country through service in private industry, in various levels of government, and in academic institutions as managers and scientists.

Following is a description of some of the major activities of the program and selected examples of accomplishment made possible by this program.

Current Activities: The following research program activities indicate the range of research funded under this Act:

Forestry research is broadly inclusive and thus deals with many of the current concerns of the Nation. The President's message on Building a Better America touched on several areas that have long been important in forestry research. Acid rain, global climate change, recreation, wetlands, reforestation, and carbon dioxide concentration are examples of ongoing research in the McIntire-Stennis Program.

Increasing the profitability of the forest resource base through effective management of the forest resource is being vigorously pursued.

Biotechnology in forestry promises to enhance the benefits from modified trees due to faster growth rates, improved wood characteristics for various uses, and greater freedom from losses due to insects and diseases. The latter achievement would reduce the need to use chemicals to control these forest pests, thus benefiting the environment.

The advent of high capacity microcomputers has made possible several developments in information management such as: expert systems, data base manipulations, and map and image processing. Forestry research is combining these new tools for improved management capability for production of the multiple outputs of forests.

Water quality and quantity is a major aspect of forest management which is becoming more essential as our population grows. Forests cover one-third of the Nation's land and are initial recipients of an even larger portion of the precipitation received. Research to improve water yield from forested watersheds is a major thrust.

Forest wildlife research is providing essential information for science-based wildlife management. This research is also the basis for forest managers to understand and deal with the impacts of wildlife on the forest, as well as to know the effects of forestry practices on wildlife species associated with forests.

Changes in the agricultural economy make it imperative that research efforts focus on enhancing productivity and conserving resources. Research programs are seeking to develop knowledge and techniques which will facilitate wise choices in the utilization of the Nation's forest resources.

Selected Examples of Recent Progress:

Agroforestry Regimes Offer Financial Opportunity. A study by forest biologists and economists at the University of Missouri-Columbia has demonstrated that walnut agroforestry is a viable land use option and may provide one of the best investment opportunities available in forestry. Research in this program demonstrates that walnut agroforestry provides economic diversification for farm operators while serving as an effective alternative to the more conventional mechanical methods for soil erosion control. When properly utilized, agroforestry enables the gradual removal over time of highly erodible cropland from row crop production, thus enhancing flexibility.

Genetic Diversity Important for Survival. Researchers at the University of Vermont have established that reductions in jack pine stand density are not based primarily on random selection processes, but that individual trees with high levels of genetic variability have a significantly higher survival rate than individual trees with low levels of genetic variability. Average genetic diversity increases with age. Natural thinning processes represent an inherent mechanism that promotes and conserves genetic diversity within populations of at least some tree species. The implications for management strategy seem to be that retention of, and regeneration from, older individual trees is desirable.

Biological Agents Used to Clean Up Soil and Groundwater. Chemicals used for wood preservation and in other manufacturing processes are serious contaminants in soil and goundwater around many plant sites. Research at the Mississippi Forest Products Laboratory on the use of biological agents to destroy these contaminants has provided a low cost alternative for cleaning up contaminated sites. The Laboratory's results have been adopted nationally by the wood treating industry to meet State and Federal environmental regulations. As a result of this and other work on biological treatments of contaminated soils and groundwater, the Mississippi Forest Products Laboratory was selected as one of five laboratories in the United States to evaluate a new dioxin analysis procedure developed by the Environmental Protection Agency.

EVANS-ALLEN PROGRAM, 1890 COLLEGES AND TUSKEGEE UNIVERSITY

The Evans-Allen formula funded research program for the 1890 Colleges and Tuskegee University was established in the Food and Agriculture Act of 1977, as amended. Section 1445 of P.L. 95-113 authorized annual appropriations to support continuing agricultural research at the 1890 Colleges and Tuskegee University and funds were appropriated beginning in fiscal year 1979. This program indirectly supports development of agricultural expertise by providing training opportunities for students to assist in the research projects being conducted by scientists at these institutions.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds.

Current Activities: The annual research program at the 1890 Colleges and Tuskegee University places emphasis in the areas of small-scale agriculture, human nutrition, rural development and quality of living, crop resources, and animal resources.

Small-Scale Agriculture. Research on farm systems for small scale producers must be totally integrated into a comprehensive plan responsive to total needs of a particular farm enterprise system coupling production, utilization, and marketing of the farm commodity. In order to increase agricultural incomes from small farm units, total comprehensive research plans have been developed that consider all aspects of cost and management efficiencies in production, utilization, and marketing and then integrate these separate factors into a comprehensive program package. For example, research on vegetable production systems has shown that small producers could effectively utilize plastic mulch to promote earliness in vegetable production and take advantage of higher early season prices and also permit double cropping. Use of black plastic in early planted tomatoes produced 60 percent higher yields than on bare soil. Cabbage planted after tomatoes produced head yields that were 29 percent higher with split nitrogen applications than those with single nitrogen applications.

Human Nutrition. Human nutrition research provides fundamental knowledge about the relationship of food eaten by people to their physical and mental status and development and the levels of well-being maintained during their life span. Research has also been conducted on human requirements for nutrients.

Rural Development and Quality of Living. Research on income improvement in rural communities will identify ways by which depressed areas can attain full economic potential. Only by providing adequate income opportunities can these communities retain more of their young people and finance the kind of public and private facilities and services that make them attractive places to live.

Crop Resources. Breeding, selection, and utilization of crops is a major concern of scientists. This includes development of drought, insect, and disease resistant cultivars. Efforts on evaluation of crops to be grown on soils not suitable for commonly grown crops because of pathogens, nematodes, and insects are being undertaken. Studies are being conducted on the mechanisms of both natural and artificial regulators that are known to influence plant growth and development.

Animal Resources. Studies are being conducted on disease, parasites, and other health hazards that are major causes of reduced productivity in food animals. Research objectives are aimed at the development of technology for prevention, treatment, and control of these problems. Research of sufficient concentration is being mounted to elucidate the cellular mechanisms that govern protein and fat synthesis in farm animals. Investigations on such factors as genetics, nutrition, and endocrinological factors provided needed information on biomechanisms.

Selected Examples of Recent Progress:

The Storage of Fruits and Vegetables in Ice-Walled Containers. Limited resource farmers, who produce fruits and vegetables, need an inexpensive means of precooling and temporarily storing their products in order to get better products to market. In Georgia, at Fort Valley State College, researchers were issued a U.S. Patent on a container that can be used for precooling, shipping and storing. The cost of shipping fruits and vegetables will be reduced, since the container is insulated and will permit shipping products several hundred miles in nonrefrigerated vehicles. The containers are reusable; therefore, the cost of shipping containers will be reduced.

Aquaculture Research for Small Scale Commercial and Home Use-Application. Agriculture, especially tobacco production, has encountered many setbacks in recent years. Alternative or supplemental crops must be investigated to ensure the future viability of agriculture in many regions. The purpose of this project has been to develop aquaculture production techniques applicable under the agro-climatic conditions of Kentucky. Priority areas of research have been the determination of pond and cage stocking densities, required fingerling sizes, pond loading rates for cages, methods of fingerling production, overwintering, polyculture, and feeding methods. Scientists at Kentucky State

University have developed production/management recommendations specific to Kentucky and provided technical support for individuals interested in aquaculture production. Since 1984, the number of producers in Kentucky has increased approximately 90-110 percent and land production acreage has increased 400 percent. Also, two processing plants have recently opened. With production increase, secondary jobs in processing, feed production, transport, etc. are generated at a rate of approximately 4 indirect jobs for every direct job in production.

Use of Water Treatments (Sodium Bi-carbonate and Magnesium Sulfate) to Reduce Salmonella Contamination on Poultry Carcasses. Salmonella contamination of poultry carcasses in processing plants has received considerable attention in recent months. The bacteria not only cause disease problems in the poultry industry but are among the serious pathogens most often transmitted to humans. Therefore, there is an urgent need to develop a technology to reduce Salmonella contamination to protect human health. Spreading of feces over the chick during evisceration has been identified as the major vehicle of contamination for the dressed carcass. Many methods have been used to reduce or eliminate Salmonella contamination, such as drugs, chlorination of chill tanks and the incorporation or Furazolidine in poultry feed; however, very little success has been reported. The problem is to develop a technology which will reduce the level of contamination, have limited or no residual effect, be cost effective and have practical application. Prairie View A&M University in Texas has preliminary results indicating that total plate count (TPC) of bacteria on the surface of the carcasses was reduced significantly when carcasses were washed with 10 gallons of magnesium sulfate per gallon of drinking water. When varying levels of sodium bicarbonate were added to the solution the bacterial count decreased with increased levels of sodium bicarbonate. Bacterial contamination of the carcass was related to the reduction in fecal bacteria. The use of water treatment prior to processing would reduce bacteria contamination, lessen the work-load for workers in the processing plants and increase the flow of chickens through the plants. Workers in processing plants would work with less feces, resulting in a cleaner and healthier processing environment. The job would be more sanitary, less stressful and reduce Salmonella contamination.

Tactics for Management of Soybean Pest Complexes: Potential of Entomopathogens for Suppression of Lepidopterous Pests. Because chemical insecticide usage is subjected to so much controversy, a shift to the use of microbial insecticides has begun. This type of control has several advantages over chemical usage. Entomopathogens are relatively specific and do not harm beneficial insects, and they pose no hazard to plants, livestock, wildlife or man. This research was begun to find a bacterium comparable to the successful microbial insecticide Bacillus thuringiensis. After three summers of field surveys of larva populations of the silver-spotted skipper (Epargyreus clarus), six potential microbial insecticide candidates have been isolated by scientists at the University of Maryland-Eastern Shore. In bioassays utilizing the corn earworm the percentage of larva mortality caused by these isolates ranged from 44-72 percent, and of those insects which survived the infection, 28 percent were unable to pupate. All six bacterial isolates are likely candidates for biocontrol. The numbers of micro-organisms that have been isolated, developed and then commercialized for the safe and effective control of insect pests have been far too few considering the advantages of their usage in Agriculture. This research avenue may not only identify the organisms for use, but may also result in finding safe sources of biodegradable compounds that could be used as pesticides.

SPECIAL RESEARCH GRANTS

The Special Research Grants program concentrates on problems of national and local interest beyond the normal emphasis in the formula programs. The objectives of this program are to facilitate or expand promising breakthroughs in areas of food and agricultural sciences of importance to the Nation and to facilitate or expand ongoing State-Federal food and agricultural research programs.

Following is a description of current activities and selected examples of accomplishments from these appropriated funds.

Current Activities: In fiscal year 1990 under the Special Research Grants program, grants will be made to the four regional leader laboratories and the headquarters laboratory to continue the pesticide clearance and minor use animal drugs research program (New York, Michigan, Florida, California, and New Jersey) and to continue the ongoing pesticide impact assessment program. Each of the Agricultural Experiment Stations in Idaho, Oregon, and Washington will receive a grant to continue the research on soil erosion in the Pacific Northwest. Regional/National impact grants grants will also be awarded in a number of other areas including water quality, rural development, integrated pest management, tropical and subtropical research, acid precipitation, pesticide impact assessment, wood utilization, and the National Biological Impact Assessment Program.

In fiscal year 1990, Special Research Grants will be awarded competitively, utilizing peer panels of scientists to evaluate the scientific merit of proposals in the areas of animal health, aquaculture, integrated pest management, water quality, and rangeland research. Animal health research will be limited to specific, high priority problems as recommended by the Animal Health Science Research Advisory Board. Solicitation of applications for fiscal year 1990 grants to be awarded competitively have been published. It is anticipated that grants will be awarded by August 1990.

In fiscal year 1989, 176 grants and cooperative agreements were awarded competitively. Given below are details on the number of proposals submitted and the number of grants for each area.

Specific Area of Inquiry	Number of Proposals Submitted	Amount Requested	Number of Grants/Agreements Awarded	Amount of Awards
P.L. 89-106:				
Animal Health/Aquaculture	309	$39,696,919	62	$5,545,800
Integrated Pest Management	176	9,820,000	81	2,787,120
P.L. 97-98:				
Rangeland	46	3,571,993	8	454,991
Groundwater Quality	239	18,958,104	25	2,873,625

Selected Examples of Recent Progress:

Animal Health/Aquaculture. As the aquaculture industry expands there is a need to reduce the cost of formulated feeds by replacing costly feed ingredients such as fish meal with alternate protein sources that are economical and effective. A multi-state research program in the Western region has developed to evaluate the nutritive value of alternate protein sources in the diets of cultured trout and salmon. Progress has been made in establishing optimal levels of poultry by-product meal in diets specifically intended for post-juvenile salmonids. Use of agricultural by-products is expected to contribute to stabilization of feed prices and consequently the cost of rearing salmonids. In vitro methods to reliably predict the digestability of alternative protein sources are being developed allowing feed formulators to evaluate the impacts of various dietary protein substitutions, thereby ensuring consistent performance characteristics of fish feeds.

Aquaculture. Enteric septicemia of channel catfish, caused by the bacterium *Edwardsiella ictaluri* is a major disease problem in the aquaculture industry resulting in losses of over $10 million a year. Researchers in Louisiana have developed a novel approach to control this disease that includes an immersion vaccination of fry followed by an oral booster vaccination of fingerlings. The effectiveness and economic feasibility of the immersion and oral vaccines have been established. Research to isolate and characterize the antigens expressed on the surface of the bacterium has been initiated as well as studies to determine their relative role in stimulating a protective immune response in channel catfish. This research should provide producers with a viable and economical control for this important disease.

Integrated Pest Management. Research at the Minnesota Agricultural Experiment Station on potato IPM has demonstrated that the yield reducing effects of interacting stresses of multiple pests (potato leafhopper, Colorado potato beetle, early blight, and Verticillium wilt (potato early dying)), and available water and nitrogen fertilization essentially function independently. There was no significant interaction between Verticillium and water or between water and potato leafhopper or between Verticillium and nitrogen. This was contrary to the general belief of potato growers that Verticillium wilt can be overcome to some extent by adding additional nitrogen or by avoiding water stress, and it is commonly thought that potato leafhopper causes greater yield losses in potatoes under water stress. This knowledge of pest interactions will result in improved management and conservation of agricultural inputs.

The application of IPM principles at the North Carolina Agricultural Experiment Station has led to a more economically and environmentally acceptable system of combating a pest complex of soybeans. Soybean fields predicted to have a soybean cyst nematode problem can also be expected to have increased weed and insect problems and negligible profit potential. As a result of an IPM study, North Carolina will recommend crop rotation as the most economically feasible means of combating soybean cyst nematode and the associated pest problems. The combined inputs for nematode, insect and weed control make soybean production economically prohibitive where soybean cyst nematode populations are present.

A predatory mite that manages spider mites in deciduous orchards and vineyards in California has been successfully selected for multiple-insecticide-resistance so the predatory mite can be used in conjunction with insecticides applied for other pest problems in the orchard. Economic analysis concluded that the genetic improvement approach is extraordinarily cost effective, as well as unique. Current estimates suggest that about 65 percent of almond growers have adopted the program, and savings are conservatively estimated to be approximately $21 million per year in California.

In corn after corn cropping systems, foliar pathogens survive the winter in plant debris and may become a problem under reduced tillage systems. Research at the Illinois Agricultural Experiment Station evaluated the effect of three tillage systems on northern corn leaf blight. Ridge-till and fall cultivation reduced disease on susceptible hybrids, while the same hybrid planted to no-till suffered severe yield losses. The important factor for ridge-till was the use of coulters on the corn planter that shift soil from the top of the ridge to cover the plant debris located between the ridges to allow for the decomposition of plant debris by soil-borne microorganisms. Significant yield enhancement of 10-20 bushels/acre would result from this practice in a year of high disease pressure.

Research at the Texas Agricultural Experiment Station has resulted in a decision aid that reduces the number of sprays needed to manage pecan nut casebearer of pecans to a maximum of 1 spray/year from the common practice of 2-3 sprays/year. The decision aid is a degree-day model that predicts when pecan nut casebearer damage is imminent. This saves the average producer $100/acre and the environment 4 lbs./acre of pesticide annually.

Pesticide Impact Assessment. Research conducted at the University of Hawaii made possible the continued shipment of papayas to the mainland without fumigation with the canceled pesticide, ethylene dibromide (EDB). Quarantine requirements stipulate that papaya being shipped from Hawaii to California and other states be treated with EDB. However, with the cancellation of EDB an alternative treatment was needed. Previous research by Hawaii, in cooperation with the California Department of Food and Agriculture, showed that the EDB fumigation treatment resulted in detectable residue in fruit. When it became obvious that EDB would be discontinued, research was planned and carried out that resulted in alternative, non-pesticidal, methods of fruit fly control. A hot water treatment was developed that effectively controlled fruit flies without causing excessive damage to the fruit. This enabled quarantine requirements to be amended to permit this new treatment in lieu of fumigation with EDB.

Rural Development Centers. A study funded by the Northeast Regional Center for Rural Development and conducted cooperatively with the University of Maryland found that the leading job generating activities in a sample of fifteen rural counties on the Delmarva peninsula and southern Maryland were: (1) industrial parks; (2) economic development organizations; and (3) tourism promotion. Industrial parks are most successful, when: (1) the county also has an economic development organization such as a strong Chamber of Commerce, private sector group, or unit of county or municipal government, and (2) special arrangements to secure adequate industrial development capital. Ironically, the failure of industrial parks occurs most frequently in the more economically disadvantaged counties that need it most. Some exceptions to this are counties that have obtained government grants, counties that have state or Federal facilities located in them, or those with natural resources that attract tourism. The findings of this pilot study help to verify current strategies for rural development and indicate promising areas for creating new strategies.

Tropical - Subtropical Research. Scientists at the Florida, Puerto Rico and Virgin Islands Agricultural Experiment Stations are cooperating on a project to reduce the uneven bearing behavior of mango, an important tropical fruit, which is becoming a commercial export commodity of the Caribbean. A major problem of mango is the uneven harvests caused by erratic flowering and much preharvest fruit drop. These scientists are attempting to correct this problem by studying the physiology of mango flowering; determining why foliar applications of potassium nitrate works part of the time; and finding, and using correctly, growth regulators to promote uniform flowering and fruit development.

Wood Utilization. Scientists at Michigan State University have identified a chemical grouping that imparts the decay resistance in black locust heartwood. Isolation of this group and its introduction into blanks of an easily decayed species (aspen) has proven to provide decay resistance to that species. The promise of identifying and producing a naturally occurring wood preservative may provide an alternative to the presently available wood preservatives that are considered hazardous chemicals.

Rangeland Research. The invasion of unpalatable plants into a range-plant community increases the grazing pressure on palatable range plants. Several studies are examining means to control these undesirable plants through various biological control methods. Allelopathy is the term used to describe the adverse impact of a plant on the growth of competing plants. Some plants are able to reduce competition through the development in or by a plant of a chemical or chemicals to kill or retard the growth of competing plants. Experiments in Colorado are examining the mechanism associated with ability of a species to successfully compete in the range community. The results of these studies may provide biological means for managing rangelands to achieve desired plant species in a range ecosystem.

Crambe/Rapeseed Commercialization. The effort to commercialize crambe and industrial rapeseed benefited from partnerships with the private sector and academia. Land Grant Universities from the eight participating states (Idaho, Illinois, Iowa, Kansas, Missouri, Nebraska, New Mexico, and North Dakota) are developing ways to reduce the cost of producing the crops, thus making the oils more attractive for use in industrial products. A January 1989 marketing workshop involving the private sector helped rank commercialization opportunities with lubricants, nylons and polymers, and coatings selected as the most promising. The project formed four partnership activities with the private sector in 1989 and initiated discussions with numerous other firms. The four partnerships to develop markets for crambe and rapeseed oils involve: (1) third party testing of a new automatic transmission fluid developed by a small firm, (2) coordinating sale and transportation of 317,000 pounds of crambe for a commercial crush and subsequent sale of the oil to an Ohio firm, (3) agreement to coordinate growout by farmers of up to 2,000 acres of crambe in 1990 if the Ohio firm decides it wants to use crambe oil next year, and (4) testing the next phase (in commercial pilot plant equipment) of development of nylon 1313 and other high temperature, low moisture absorbing polymers by a Missouri firm. Discussions are underway with several major firms to further commercial use of crambe and rapeseed oils. The project received two proposals to test fuels derived from crambe/rapeseed as methods to help cities meet air quality standards.

Low-Input Sustainable Agriculture (LISA) Research and Education. Now in its third year, the LISA research and education program supports or has supported 78 projects ranging from studies to determine the feasibility and economic effects of reducing farmers' dependence on purchased chemicals and other inputs, relying more on skilled management and onfarm resources, greater use of rotations, animal and green manures, conservation practices, biological pest controls, and the like. Projects approved for funding by administrative councils in each of four U.S. regions range from studies of the effects of reducing the need for purchased inputs in apple production, to research on low-input sustainable methods of producing everything from corn and soybeans, to pork, fruits, and vegetables. Other projects focus on developing educational materials for farmers. Program results so far include 1) successful formation of new teams of farmers, representatives of private organizations, and university and USDA professionals to identify LISA research and education needs and to review and approve project proposals; 2) the initiation and conduct of projects expected to boost the interest and involvement of USDA-land grant university professionals in such work; and 3) tentative study results to be compiled, interpreted, and reported in the Spring or early Summer of 1990.

COMPETITIVE RESEARCH GRANTS

The Competitive Research Grants program was initiated by the Department in 1978 to fund basic research in selected high priority areas related to plant production and human nutrition. Basic research initiatives implemented in 1985 encompassed broader research perspectives pertinent to the national interest in plant and animal science and biotechnology. The competitive research grants complement the on-going research efforts of the USDA and the traditional agricultural research arena by encouraging the participation of outstanding research scientists throughout the entire U.S. scientific community who have expertise in these areas.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current Activities: The targeted areas were identified as possessing great opportunities for scientific discoveries and for contributing to research vitally needed to solve important food problems. There are four target areas in plant science relating to crop productivity: photosynthesis, nitrogen fixation, genetic mechanisms for crop improvement, and plant protection from biological stress (e.g. insects, microbes, viruses, and nematodes). The target area in human nutrition addresses the establishment and bioavailability of human nutrient requirements. Soybean research, alcohol fuels, pest science (gypsy moth, boll weevil/bollworm, and pine bark beetle), and animal science (reproductive physiology and brucellosis) were specific targeted research categories begun in 1985. The 1985 biotechnology initiative targeted compelling agricultural research needs in these areas: Structure, function and organization of plant, animal, microbial genomes; transfer, expression, and regulation of individual genes and gene systems; and genetic and molecular control of growth, development, and resistance to physical and biological stress. In 1989, a new program for Stratospheric Ozone Depletion as related to crop productivity was initiated.

The Competitive Research Grants Program received 1,420 research proposals in fiscal year 1989 requesting about $333 million for support of research in the targeted areas. From those proposals 334 grants were made. The total funds dispersed amounted to $37.7 million. Table 6 provides details on the number of proposals submitted, the number of grants awarded, and the major categories of grant organizations.

Selected Examples of Recent Progress:

PLANT SCIENCE

Photosynthesis. Photosynthesis is the key process in all plants upon which all life is dependent. Until only recently understanding the mechanics of oxygen evolution was considered to be one of nature's most intractable problems. However, the oxygen evolving apparatus can now be studied because of recent progress in the application of techniques of physics, chemistry and molecular biology to these problems. A Michigan State University laboratory using techniques of spectroscopy, biochemistry and molecular biology, has identified two critical amino acid residues of tyrosine which are involved in oxygen evolution. These researchers have determined the precise location of one of the tyrosines in the protein by genetically engineering a photosynthetic microorganism to have a tyrosine-altered protein. Using similar techniques, an investigator at Rutgers University in New Jersey, has determined that another protein which binds manganese is also involved in oxygen evolution. These results open up new avenues of research which may lead to practical applications.

Biological Nitrogen Fixation and Metabolism. Production of high-quality, protein-rich foods in amounts to feed an increasing world population is extremely dependent on the availability of utilizable nitrogen. Biological nitrogen fixation is a worldwide major process by which utilizable nitrogen (for example, ammonium) is added to crops and soils. In agricultural systems, the legume host plant-rhizobium bacterium symbiosis is the major contributor to nitrogen fixation. Utilizing this symbiotic system to best advantage to avoid excessive use of nitrogen fertilizers, which are costly financially and environmentally, is a goal farmers, agronomists and biotechnologists hope to achieve. Using immunological techniques an investigator at Oregon State University has determined that there are ten competing R. leguminosarum, var trifolii types in an acid pasture soil under study. Results of this research have added more factors to the picture of Rhizobial competition: changing soil acidity, fertilizers and water stress conditions all appear to affect the relative nodulating abilities of the ten competing strains. The formation of effective nitrogen fixing in root nodules involves coordinated expression of bacterial and host plant genes. The central critical biological catalyst of nitrogen fixation is nitrogenase, an enzyme produced by expression of genes carried in the bacteria. In studies of the coordination of bacterial and host plant genes, workers at the University of Minnesota have determined that in effective nodules, the nitrogenase activity is 95 percent more than in ineffective nodules; while the amount of leghaemoglobin, a protein which protects the nitrogenase from oxygen inhibition is found at levels approaching 3.5 times more in effective nodules than in ineffective nodules. The leghaemoglobin is produced by expression of plant genes and appears just before or at the same time that the nitrogenase activity appears. The mechanisms which regulate these interactions are under investigation.

Biological Stress on Plants - Plant Pathology/Weed Science. Competition between red alder seedlings and Douglas-fir seedlings was studied by investigators at Oregon State University. The results suggest that growth losses of the tree seedlings were a result of competition for resources. The overstory red alder reduced light penetration through the stand canopies directly by interception. The understory Douglas-fir is more shade tolerant. Manipulation of both species' densities influenced tree growth through resultant changes in light and soil moisture availability. This information has allowed foresters new management strategies, that is, one can modify the size of the forest stand of the Douglas-fir - red alder combination either by thinning the stand or by the density of the plantings.

Investigators at Cornell University in New York are using molecular techniques to identify strains of the fungus, Phytophthora, a causal agent of late blight of potatoes, and to determine the relationships among several important pathogen populations around the world. In the past, population genetics studies have been restricted by inadequate markers, and by ignorance concerning Mendelian genetics with fungi. Recent developments with Phytophthora infestans concerning both markers and genetics have largely removed these restrictions. The information obtained now allows investigators to track the spread of the outbreak of late blight of potatoes and to pinpoint the probable origin of the particular strain of the pathogen.

Biological Stress on Plants - Entomology/Nematology. Alfalfa is an important forage crop for the beef, dairy and horse industries and aphids are a serious threat to its production. Researchers at Oklahoma State University are investigating why different aphid species cause different degrees of damage in alfalfa host plants, what factors mediate the damage symptoms and how tolerant-resistant plants overcome the damage process. These studies center on the epicuticular wax of the plant where feeding by aphids is initiated. By examining a number of resistant and susceptible plants, these investigators first determined that lipid composition of the waxy plant surface determined the preference of the aphid to feed or not. A chemical process called lipid peroxidation is initiated upon feeding and it is this process which is likely to be responsible for damage to the plant. Lipid peroxidation has been implicated in damage to membranes and as a cause of leaf senescence. Research is proceeding to determine if resistant plants have a greater capacity to limit lipid peroxidation. If this proves true, breeding for lipid peroxidation and improved aphid resistance is a possibility.

Plant Genetics. Rapid advances in the gene mapping technology has made it possible to construct a genetic map of major crop plants. Competitive Research Grant funds have supported research which has contributed to the development of two key technologies; a restriction fragment length polymorphism (RFLP) mapping and a gene tagging technology using transposable elements. Genetic maps are important tools for the identification and localization of genes of agricultural importance, and to the development of new breeding strategies as well as to the application of biotechnology to agricultural crops. North Carolina State University scientists have demonstrated that the use of RFLP mapping technology allows the identification of multi gene traits such as grain yield, hybrid vigor or kernel maturity on specific regions of chromosomes in corn. A scientist at Cornell University in New York has demonstrated that the use of RFLP markers allow the isolation of genes for single-gene traits such as resistance to root-knot nematode, or resistance to fungal wilt disease in tomato. A group at Iowa State University has shown that multi gene traits identified by both RFLP technology and transposon tagging technology match closely in corn, thus verifying the validity of both technologies. With a plant species like corn or tomato where a tremendous amount of cytogenetics and breeding studies have been carried out, the identification of chromosomal loci for desirable genetic traits will facilitate rapid incorporation of those traits into inbred elite lines. It is anticipated that additional gene mapping technologies will be developed as a result of Competitive Research Grant funding support of basic molecular genetics, and as a byproduct of the NIH/DOE Human Genome project. These mapping technologies will increase the efficiency and ease of constructing genetic maps for major agricultural crops.

Alcohol Fuels. Many environmental ill-effects result from burning of fossil fuels. As alternative energy sources, alcohol and other hydrocarbons from biomass have been identified as superior alternatives because these are renewable resources currently untapped. The Competitive Research Grants Alcohol Fuels program supports fundamental research that is designed to provide necessary information in developing efficient mechanisms of biomass utilization for alcohol and other hydrocarbon productions. The limiting steps to be overcome in developing useful biomass conversion systems are many. Efficient processing mechanisms for breaking down complex carbohydrate molecules that constitute biomass into simple sugar molecules is one; the development of an organism that can utilize those simple sugars efficiently to produce alcohols and other hydrocarbons is another. A scientist at University of Florida has genetically engineered E. coli, a common bacterium, to produce ethanol from various sugars that can be found in relative abundance in the agricultural and forestry biomass. A scientist at Rutgers University in New Jersey is investigating the possibility of developing a new bacterial system that is capable of carrying out the entire biomass conversion process from the breakdown of complex carbohydrates to sugars and the conversion of the sugars to alcohol. In addition to the obvious relevance of this research to the increased capability for alcohol fuel production in this country, they and other research projects being supported by the Alcohol Fuels Program will contribute to the development of alternate uses of surplus agricultural commodity.

BIOTECHNOLOGY

Biological Stress On Plants. Manipulating or transferring genes into insects of economic importance offers new potential for controlling insect pests. Though gene-transfer methods have unlimited benefits, the only existing vector for transferring genetic information in whole insects is the P-element transposon from Drosophila. A researcher in Florida is investigating whether the Drosophila P-element will be useful to transform economically important insect species and whether other mobile genetic elements can be identified from non-drosophilids. A rapid test for P-element mobility has been developed which can ascertain whether excision events have taken place in the embryo rather than relying on intensive selection schemes or other genetic tests. Work continues into the development of a transposon-capture method that will allow mobile genetic elements to be captured from insect embryos.

Recent work by investigators at the University of California, Riverside has shown that the coat protein of the tobacco mosaic virus as opposed to the RNA itself is the active molecule involved in the induction of local lesions (necrosis) in the host tobacco plant. In a second area of virus-host interactions the induction of disease symptoms due to disruption of chloroplast function is being investigated. A series of deletion mutants have been produced that cause a gradient of degradation of already developed chloroplasts. Since very little is known about how viruses cause disease, an understanding of the virus-host relationship will be vital for the design of future plant disease control strategies.

Plant Molecular Biology. Improved food quality is one of the goals of agricultural biotechnology. Many factors that control food quality can be dissected into a series of physiological and biochemical processes that are ultimately controlled by the genes that encode for those processes. Ripening of tomatoes, for example, is visually determined by the changes in color and texture. The changes in color and texture, in turn, are brought about by complex biochemical reactions in the cell. Several investigators are studying the molecular basis for fruit ripening. In a collaborative research project between a scientist at University of California at Berkeley and a scientist at University of California at Davis, the enzymes responsible for the softening of tomato fruit tissues are being elucidated. Another investigator at University of California at Berkeley is studying enzymes involved in the color development in tomato fruits. The emphasis of these investigations is on the understanding of the mechanisms of expression of the genes that are involved in fruit ripening processes. Studies by these investigators and others have shown that the expression of fruit softening and coloring genes are regulated by external factors such as light, temperature, and plant hormones. Once the genes that control processes of fruit ripening have been identified and how these genes are regulated has been elucidated, it will be possible to manipulate those genes to produce tomato varieties designed to fit specific needs; tomatoes with more solids for canning, tomatoes with higher liquid/less acid contents for juice industry, tomatoes where timing for ripening can be manipulated, or tomatoes with better flavor. More importantly, some of the ripening mechanisms are common to all fruits and the knowledge obtained with the tomato system could be applied to alter ripening processes of other fruits. Application of these results to fruit and vegetable production will be of great value to American agriculture.

An investigator at University of Wisconsin has determined that a highly competitive strain of Rhizobium (Rhizobium leguminosarum var trifolii) limits clover root nodulation by other strains through the production of a potent anti-rhizobial peptide, trifolitoxin. Using techniques of molecular biology and genetic engineering, the researcher has identified the bacterial gene for the anti-rhizobial compound and has also determined that the strain producing this compound is protected from self-annihilation because it also contains genetic information which confers resistance to the compound. In an effort to develop trifolitoxin-producing strains for field use, the trifolitoxin genes have been transferred to the chromosome of a superior strain of Rhizobium. The compound has been characterized chemically. It is a simple molecule which absorbs ultraviolet light.

Plant Growth and Development. Gibberellins (GAs) are a class of plant hormones that are involved in many key processes of growth and development including seed germination, stem growth, flower development, and fruit setting. While GAs are already being used in the field as a growth regulator, the biochemical and genetic basis of GA control of growth and development is largely unknown. Many other potential applications of GAs to crop production have not been realized because of this limited knowledge. An investigator in North Dakota, has been studying how GA and cold temperature interact to control a transition from the vegetative to the reproductive state of plant growth. The first visible sign of the transition is the elongation of the stem which eventually develops flowers at the growing tip. The investigator has found that the cold treatment of the plant induces the synthesis of GAs in the plants before the stem elongation becomes obvious. Further investigation is being conducted to ascertain how the cold temperature stimulates the GA synthesis and how GAs stimulate stem elongation. Results of this research will contribute to our fundamental understanding of how the plant hormone, gibberellin, exerts its effects on plant growth and development. Such information can be used to develop various ways to manipulate growth and development of crop plants.

Environmental Stress on Plants. An investigator at the University of Maine has found that potato tubers, subjected to low oxygen conditions, generally found during storage, in transportation, or upon planting become more susceptible to bacterial disease. Studies are underway to identify host factors that are induced upon wounding by pathogens or during handling and are responsible for aerobic resistance to the bacterial enzymes.

Early stages of plant reproductive development in maize are generally the most vulnerable in response to limited water. While it has been commonly assumed that the reduction in kernels was due to the asynchronous timing of floral development, an investigator in Minnesota, has found that water-deficient plants fail to produce grain even if flower development is normal and pollination occurs. Results of studying other environmental factors in addition to limited water have led researchers to conclude that other metabolic or hormonal factors may be responsible for the failure of grain development under water stress.

Animal Molecular Biology. Pseudorabies is a significant and costly disease of swine resulting in productivity losses and death in young animals. Since pseudorabies is caused by a herpesvirus, recovered swine serve as a source of latent infectious virus. It was not known whether this latent infection was localized in the lymphoid or nervous system. Using molecular biology techniques, researchers at the University of Nebraska have found that the virus establishes a latent infection in the nervous system of swine. This is similar to the cold sore virus in humans. It is hoped that these techniques can be adapted to a quick diagnosis system so that infected swine can be identified and removed from the population.

Animal Growth and Development. Evidence continues to accumulate that the immune system and hormones interact during growth and development. Investigators at the University of Illinois have demonstrated that a developmental axis exists between the pituitary and thymus glands in swine. They have also established that a growth hormone causes an increase in a bacteria killing enzyme present in certain white blood cells. This research continues to provide significant information useful in the production of food and fiber animals.

INSECT PEST SCIENCE

Plants have a number of defense systems which protect them from attack by insects. A continuous source of chemicals may be present in plant tissue which prove toxic to insects, or an inducible defense system may be set into action only after physical damage to the plant has occurred. Both systems are important to plant protection because successful breeding for or using DNA technologies to improve pest resistance in crops and trees will depend on a keen understanding of characteristics which provide resistance. Rresearchers at the University of California, Davis are studying inducible defense in tomatoes in response to feeding by the tomato fruitworm (bollworm), *Heliothis*. In this investigation, plant enzymes, which are relatively unexplored as defensive compounds, may oxidize constitutive defensive compounds (ever present) to reactive reagents which react with proteins and impair nutritive value to insects. The goal of the research is to understand these reactions and how insects are affected by them. At Washington State University researchers are interested in pine defenses induced by the destructive pine bark beetle. When attacked, a tree may survive by producing oleoresins which serve to immobilize and poison invading bark beetles and the pathogenic fungus the beetles carry. These scientists are discerning the chemical nature of oleoresin elicitors and the time course for their induction. Host plant chemistry can also influence the pathogens or predators which naturally regulate pest populations. Scientists at the Pennsylvania State University are investigating how host plant leaf chemistry influences gypsy moth susceptibility to a nuclear polyhedrosis viral pathogen (NPV). Through this study, plant-insect interactions which limit the effectiveness of biological control agents, such as NPV, are being discerned.

ANIMAL SCIENCE

Control of Sexual Maturation in Sheep. One way to increase reproductive efficiency of food and fiber producing animals is to decrease the age at which they reach sexual maturation (i.e. puberty) and can be bred. In animals which breed at only certain times of the year (seasonal breeders) like sheep, this is particularly important. Slow growing lambs may not attain puberty during the first breeding season which results in an economic loss for the industry. Scientists at the University of Michigan are studying how nutrition and growth can change the time of puberty. They have shown that this delay in puberty in slow-growing lambs is not because they consume less feed or due to an inability to produce the hormones which are necessary for reproduction. Rather, the delay of puberty in slow-growing lambs is due to the fact that taking in less calories causes changes in the brain pathways which control the onset of puberty in lambs. Studies are continuing which will determine if there are particular nutrients which can advance the time of sexual maturation and therefore increase reproductive efficiency.

Poultry Reproduction. Reproductive efficiency in turkeys is low in comparison to chickens, in part because of low incubation behavior or "broodiness". Experiments done at the University of Minnesota have indicated that the pituitary hormone prolactin is responsible for incubating behavior in turkeys. These scientists are now investigating how prolactin exerts its effects. These studies will help solve a significant problem for the turkey breeders of the United States.

Brucellosis. This disease is responsible for approximately $250 million annual loss to the U.S. cattle industry and is caused by *Brucella abortus*, an intracellular gram-negative bacterium, which infects macrophages, a type of white-blood cell. Since the bacteria are inside a cell, immunizations and/or antibiotics are not effective in controlling the infection. Investigators at the University of Wisconsin have determined that two lymphokines (protein hormones), interleukin-I and interferon-4, regulate the cellular immune response of cattle to B. abortus. Study of this complex interaction is continuing with the expectation that cellular regulation of antigen presentation or bacteria killing activity can be enhanced and the infection prevented or cured.

HUMAN NUTRITION

Choline as an Essential Nutrient in Humans. Although choline is considered an essential nutrient in many mammalian species, its function in humans is less clear. Investigators at Boston University School of Medicine in Massachusetts are studying the effect of choline deficiency on muscle function in humans. Subjects fed a choline deficient diet for three weeks showed an increased rate of muscle fatigue when compared to those on a choline sufficient diet. Because choline concentrations in the blood of normal humans is decreased by physical exertion, these studies may help us to understand what causes muscle fatigue in normal humans.

Measurement of Vitamin A Status in Humans. Methods are needed to evaluate the Vitamin A status of humans over a wide range of total body reserves and intakes because marginal Vitamin A status appears to be fairly common in the United States. Investigators at Iowa State University have used an isotope dilution technique to assess total body stores of Vitamin A. This study showed that poor Vitamin A and Vitamin E status was associated in Indonesian children. These scientist have also devised another simplified test for Vitamin A which requires a single blood sample. This test has been used effectively in children and adults in the United States and Indonesia. Thanks to these new tests, individuals with low Vitamin A status will be able to be identified and treated appropriately.

STRATOSPHERIC OZONE DEPLETION

Recent discovery of the ozone hole in the stratosphere has raised concerns for potential harmful effects on agricultural and forest crop productivity of ultraviolet (UV) radiation which may increase as a result of the stratospheric ozone depletion. Plants are known to respond to UV radiation by avoidance, protection and tolerance, or by making use of UV radiation for its growth and development. However, we know very little about how UV elicits these responses in plants. Currently research is being conducted that addresses basic mechanisms of plant responses to UV. A joint-project between University of Illinois and University of Wyoming investigates how plants protect themselves from potentially harmful UV radiation by changing optical properties of their leaves. Using conifer growing at higher elevations as an experimental system, the researchers are testing the hypothesis that the surface cell layers of the leaf (conifer needles) act as an "eye" of the plant toward UV and adjust their optical properties so that no harmful levels of UV would penetrate through the leaves. The results of this research will provide us with a clue as to the primary site of plant interactions with UV, which can be applied to build a predictive model to assess how well the plant is coping with UV radiation. Also, it will lead to an identification of a biochemical target(s) of UV, which may lead to the development of plant varieties with higher tolerance to UV radiation.

ANIMAL HEALTH AND DISEASE RESEARCH

The Animal Health and Disease Research (Section 1433, Public Law 95-113) formula program is directed to improving the health and productivity of animals and the welfare of producers and consumers of animal products; protecting human health through control of animal diseases transmissible to humans; minimizing livestock and poultry losses due to transportation and handling; and facilitating the effective treatment and prevention of animal diseases.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds.

Current Activites: Funds for this program have been appropriated since fiscal year 1979. Institutions receiving fiscal year 1989 funds include 38 State

Agricultural Experiment Stations and 16 Colleges of Veterinary Medicine qualifying individually. Additionally, at 13 other universities, the Station and Veterinary College qualified as combined institutions. Legislative amendments contained in Public Law 97-98, provide that an "eligible institution" for Animal Health and Disease Research funds "means an accredited school or college of veterinary medicine or a State Agricultural Experiment Station that conducts animal health and disease research."

Recommendations of the Animal Health Science Research Advisory Board are being followed in program implementation (i.e., scope and priorities of eligible research, determination of research capacity of eligible institutions and other questions on program administration). In accordance with advice of the Board, emphasis in this research centers on the solution of high priority diseases or other animal health hazards in the production of livestock, poultry, and aquaculture species.

State Comprehensive Plans for animal health research, approved by CSRS, are being followed by the eligible institutions within each State. These plans include the major areas of animal health research to be conducted by the institutions. Provisions of Section 1433 permit selection of studies within each State based on highest priority needs and capabilities of the institutions to conduct the needed research.

Research is in progress on projects seeking solutions to infectious and noninfectious diseases or parasite problems of food animals and horses. Strong emphasis is being placed on solution to respiratory, enteric, and reproductive diseases. Other major problems such as mastitis, pseudorabies, brucellosis, and toxic hazards are being investigated. Causes of disease are under study; new methods for disease diagnosis and carrier detection are being sought; new or improved treatments are being tested; methods of increasing resistance to disease are being developed; and biological methods to replace chemical control of livestock insects and internal parasites are being evaluated.

More than 100 projects were new in fiscal year 1989, providing redirection of effort toward particularly promising approaches. These new research efforts are being applied to solve problems of reproductive, enteric, and respiratory disease and gastrointestinal parasites. New or improved vaccines are being developed to control these diseases and other high priority problems such as mastitis, salmonellosis, foot rot, and transmissible gastroenteritis. New technology, including genetic engineering, monoclonal antibody, and virus fingerprinting procedures, are being employed to accelerate needed breakthroughs in quick and more accurate diagnoses and more effective control measures.

Selected Examples of Recent Progress:

Detection of Viral Pathogens to Young Poults in the U.S. Turkey Industry. The Ohio State University has developed electron microscopy and genome eletropherotyping procedures to identify the major groups of Infectious Bursal Disease viruses as a response to the turkey industry's concern for the significant problem of enteric disease in young turkey poults. These procedures and others were used to conduct two nationwide surveys of enteric viruses, bacteria and protozoa in commercial turkeys. A variety of viruses were identified (some identified for the first time e.g.. group D and atypical rotaviruses). Studies indicated the widespread occurrence of these viruses (mostly in combinations) in commercial flocks. This led to studies on the epizootiology and the pathogenesis of these infections. Currently, monoclonal antibodies to simplify and improve the sensitivity and specificity of diagnosis of these viruses are being developed. A new virus causing enteric disease in turkeys was discovered. The disease and virus is currently being characterized. The results continue to provide new knowledge on enteric viruses leading to the development of improved methods for their control. Studies are currently being done on the value of passively transferred pilus antibody in protecting young turkey poults which are the most susceptible age group to the disease.

A Quicker and More Definitive Diagnostic Test for Johne's Disease Using DNA Hybridization Probes Has Been Developed. Johne's disease or paratuberculosis is a chronic debilitating disease of all breeds of beef and dairy cattle, sheep, goats and wild ruminants. The organism induces diarrhea that is non-responsive to treatment and ultimately leads to death. A billion dollar loss to the U.S. cattle industry each year has been estimated due to premature death, debilitation of clinically ill animals and decreased production of milk and calves in animals incubating the disease. A DNA probe that detects *M. paratuberculosis* in the fecal material of infected animals has been developed by the University of Wisconsin-Madison for use in the diagnosis of Johne's disease. Differences in the restriction enzyme polymorphisms could be seen when the probe was hybridized to Southern blots of restriction enzyme digested genomic DNA from pure cultures of these species. Compared with culture results, the DNA probe identified 34.4 percent more mycobacterium containing fecal samples and testing took only 72 hours to complete compared to the current culture testing that requires from 3 weeks to 4 months for identification. Serological tests generally lack both specificity and reliability. The current research will circumvent the need for cultivation or serologic tests in the diagnosis of Johne's and other Mycobacterial diseases. Commercial application of this technique is now under way for use in a polymerase chain reaction system. The original DNA probe has been truncated to produce a diagnostic probe that will differentiate *Mycobacterium avium* and *M. intracellulare* from *M. paratuberculosis*.

Antibiotics Help to Fight Infection in Animals and Humans. Collaborative studies between the University of California, Davis, School of Veterinary Medicine and the University of California, Los Angeles, School of Medicine have provided new insights into: 1) the discovery of unique natural antibiotics from infection-fighting cells in the blood of cows; and 2) the use of natural antibiotics from the blood cells of rabbits and their use to combat mastitis pathogens of the cow. These natural antibiotics have been demonstrated to be quite good at killing many important infectious disease agents. The work includes research on basic biology (how the animal defends itself against disease), appropriate new methods to apply natural antibiotics to treatment of disease (animals and humans), food safety, and hygiene. Determining where these natural antibiotics come from, how they are made, and how to make them is currently being researched. Uncovering what goes on in nature and studying how to apply these lessons to improve our standard therapies is being discovered. The use of natural antibiotics will expand our armamentarium to fight infectious disease in animals and humans. Cattle are providing a rich source of materials for this purpose.

HIGHER EDUCATION

In fiscal year 1989 the Department conducted three higher education programs: the Morrill-Nelson Permanent Appropriation which provides $50,000 to every State and territory; Strengthening Grants to support resident instruction programs at historically black land-grant institutions and Tuskegee University; and Graduate Fellowships awarded to colleges and universities to stimulate the development of food and agricultural scientific expertise in targeted national needs areas.

Current Activities. Legislative authority for the administration of funds appropriated pursuant to Morrill-Nelson legislation was transferred to the U. S. Department of Agriculture and targeted to the food and agricultural sciences by the Food and Agriculture Act of 1981. The program was formerly administered by the Department of Education and is considered a permanent appropriation.

Fiscal year 1989 was the fifth year of funding for the Strengthening Grants Program which supports resident instruction at the 1890 Colleges and Universities, Tuskegee University, and the University of the District of Columbia. Approximately $102,496 was available this past year for distribution to each eligible institution.

In fiscal year 1989, funds were appropriated to support 58 new doctoral fellows through the USDA National Needs Graduate Fellowships Program. This program is a National investment strategy to develop agricultural scientists and professionals in areas where shortages of expertise exist. Data show a 38 percent decline in undergraduate enrollments at land-grant colleges of agriculture from 1979 to 1987 and an 11 percent decline in graduate enrollment during this same period. This trend toward declining enrollments is still continuing. There is expected to be an 8 percent decline of high school graduates in the 18 to 24 years age category by the end of this century. Further, projections on the availability of expertise in the food and agricultural sciences are showing an approximate shortfall of 16 percent in most employment categories.

Selected Examples of Recent Progress:

The latest data available denotes use of Morrill-Nelson funds for faculty salaries, teaching equipment, program development and other operating expenses. Administrative units having access to and reporting use of the monies to strengthen higher education in the food and agricultural sciences include agriculture, home economics, forestry, and veterinary medicine.

In fiscal year 1989, 18 proposals were received for funding under the Strengthening Grants program. Proposals were required to target specific areas e.g., curriculum development, faculty development, library resources enhancement, instructional equipment acquisition, and student recruitment and retention. Of the 18 proposals received, 13 requested funds to assist with student recruitment and retention. This area stresses skills deemed essential for success in food and agricultural areas. Two proposals addressed the area of instructional equipment. Funds approved for use in this category may be used to purchase equipment for instructor use to aid in the teaching of the food and agricultural sciences. The purchase of technological devices designed to support or improve instructional capabilities is also permitted. Two proposals requested funds for curriculum development. This area stresses development or enhancement of curriculum-related efforts in fields pertinent to food and agricultural sciences. Support provided is used to broaden and diversify existing curricula and introduce new relevant programs to attract outstanding students and improve employment opportunities for program graduates. A final proposal was directed toward faculty development. This area concentrates on developing faculty potential by providing opportunities for substantive growth such as advanced preparation in a field of study or participation in meetings related to improving institutional approaches and methodologies.

Approximately $2.8 million were available in fiscal year 1989 to permit the awarding of new grants to colleges and universities to support 58 new doctoral fellows in five targeted national needs areas (Biotechnology, Food Science/Human Nutrition; Engineering in Agriculture Production, Processing, and Distribution Systems; Food, Forest Products, or Agribusiness Marketing; and Water Sciences). This program is a national investment strategy to develop highly competent agricultural scientists and professionals in areas where shortages of expertise exist. There also has been a concerted effort in the program to actively recruit female and minority students. Undergraduate enrollment in land-grant colleges of agriculture decreased 38 percent between 1979 and 1987 and graduate enrollment 11 percent. A further decline in enrollment is expected because both the number and the academic ability of U.S. college-age youth have decreased in the 80's. Thus, the pool of individuals available to seek professional expertise in the food and agricultural sciences will not be as large through the 1990's, even though the number of employment opportunities exceeds the available graduates by approximately 16 percent in most employment categories.

The National Needs Graduate Fellowships Program is proving to be an important part of the solution to the human capital shortages facing U. S. agriculture. The program, funded initially in 1984, has provided support for some 432 outstanding doctoral fellows and 44 master's fellows. These young men and women represent some of the brightest minds available in the U. S. today. Whereas the national average Graduate Record Exam (GRE) score for all graduate students in agriculture is 969 (among the lowest of all disciplines and declining), the average GRE score for USDA doctoral fellows is almost 1,300. The academic excellence of these outstanding young men and women is such that they hold great promise for developing into the intellectually productive scientists and professionals essential to revitalizing U.S. agriculture's scientific and economic competitiveness.

Typically graduate students in the food and agricultural sciences require a minimum of four years to complete a doctoral degree. The USDA fellowship program provides support for doctoral study for three years and the universities are expected to support the student's fourth year of dissertation research. The fellowship program requires universities to take deliberate measures to recruit absolutely outstanding potential scientists, with particular attention to females and minorities. Program regulations allow up to 15 months for this important recruitment process. Therefore, the majority of doctoral fellows supported via 1984 USDA grants were enrolled between September 1985 and January 1986. Most are approaching graduation at this point in time. Of the few recruited very early in the program who have concluded their studies, all have accepted employment in a food or agricultural career directly related to their area of specialization with the exception of two who have secured post-doctoral appointments. The new doctoral fellows supported via fiscal year 1989 grants are presently being recruited and can thus be expected to graduate mid to late 1993. The recruitment and training of outstanding doctoral scientists requires considerable time. This fellowship program helps to minimize these lengthy time requirements by readily attracting academically outstanding students and by enabling them to pursue full-time graduate studies and complete their degree programs as quickly as possible.

WEDNESDAY, MARCH 7, 1990.

EXTENSION SERVICE

WITNESSES

CHARLES E. HESS, ASSISTANT SECRETARY FOR SCIENCE AND EDUCATION

MYRON D. JOHNSRUD, ADMINISTRATOR, EXTENSION SERVICE

RICHARD R. RANKIN, DEPUTY ADMINISTRATOR, MANAGEMENT, EXTENSION SERVICE

STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

OPENING REMARKS

Mr. WHITTEN. Dr. Johnsrud, we'll be glad to hear from you on the proposed budget for the Extension Service.

Dr. JOHNSRUD. Thank you, Mr. Chairman.

I've submitted a complete statement for the record, and I'll be quite brief.

Mr. WHITTEN. We'll be glad to have it included in the record, and you might proceed.

[CLERK'S NOTE. The full text of the administrator's statement appears on pages 543 through 551. The explanatory notes appear on pages 552 through 592.]

Dr. JOHNSRUD. Thank you. Mr. Rankin the Deputy Administrator for Management, is also at the table.

ADMINISTRATOR'S STATEMENT

I appreciate the opportunity to briefly discuss the FY 1991 Extension Service budget proposal. I want to preface my comments by saying that in the past three years, the Cooperative Extension System has taken a relook at how we can sharpen the way we do business and how we can better serve the people across the Nation. I'm pleased to say that what is reflected in this year's budget proposal is a mirror image of some of the priorities that we have identified in that process.

The major areas that we are focusing on are the health and competitiveness of American agriculture; rural economic development; environmental issues; food safety concerns; and the risks that are facing our young people across this country.

We started this process in order to focus our resources on national concerns and I think it's really gone quite well.

ACCOMPLISHMENTS

Our status of program results, which we have submitted for the record, describes some of those accomplishments. I think it's worth mentioning a few examples of programs that illustrate how the Extension System is focusing its resources.

In Mississippi, Extension has had a major effort relative to declining water tables and fewer sources of irrigation water. Part of our effort is working with other organizations and agencies in trying to be more efficient in the use of water resources. Reports show that there's been up to a 30 percent savings in the water usage.

At the University of Maryland, there have been extensive efforts on water quality. There are now water quality conservation plans in place for over 400,000 acres, throughout the state; another example of our targeted effort.

YOUTH AT RISK

I want to mention what we're doing with young people that are at risk. This is one of our major areas of emphasis. Extension has the experience and the programs that are doing well in this area, and we need to expand them.

For example, in Minnesota, 1,300 teenagers have been trained to help their younger counterparts learn about drug and alcohol abuse and what it can do to young people. These teenagers, that we have trained, work in 40 communities, and have touched the lives of 20,000 young people in the short time that this program has been in place.

FOOD SAFETY

Another area that gets a lot of attention is the area of food safety. Louisiana State University Extension Service put out a publication and did an educational program relative to food safety that they geared up rather rapidly when the issues of Alar and ECDB came on the public scene.

As a result of that, reports indicate that about 75,000 consumers have a better understanding of food safety and risk assessment.

There are other areas we can cite, but I just wanted to indicate that we are targeting on some important issues.

FY 1991 BUDGET

Our total budget proposal for fiscal year 1991 is $345.7 million, and it calls for emphasis and increases in areas that are this Administration's priority issues. While this budget does contain some of the President's proposals of reducing and eliminating certain earmarked funding, we also have increases provided and resources directed to the following program priorities: to bolster efforts in addressing water quality; youth at risk; food safety; and environmental issues. Also, to maintain support for the core programs carried out with the Smith-Lever (3)(b) and (3)(c) funds, and further enhancement of the capacity of the 1890 Institutions and Tuskegee University in conducting their programs.

We are proposing an increase of $4.3 million for the Smith-Lever (3)(b) and (3)(c) formula funds. This source of funding has been fairly constant over the years and has not really kept pace with the inflation and the cost of doing business.

This is an important part of our budget, because these funds maintain the basic core of extension specialists and agents staff for the Extension system across this country.

WATER QUALITY

Another area that we're proposing a budget increase is for water quality programs. A total of $15.5 million. This is a program that the Secretary of Agriculture has addressed in his testimony before your committee.

It's based on a plan that involves many USDA agencies, the U.S. Geological Survey, EPA, and many State agencies as a part of the implementation.

The Extension's role is specifically to provide educational programs for the farmers on how they can operate their business in terms of maintaining or enhancing and not degrading the ground water supply.

We're using a very specific approach in concert with the Soil Conservation Service, on the hydrological units.

In the first year, we have identified 37 of these units. We're using demonstration farms as a way to show how practices can help improve or maintain water quality in hydrological sites. These are very targeted parts of the water quality program.

YOUTH AT RISK

Another area that was mentioned by the President in his State of the Union message has to do with education and building human capital, specifically focused on young people.

I don't think we can deny that there are critical issues facing our young people. We have a plan and we're doing things right now in working with young people to help them deal with these difficult times.

We're proposing a $10 million program, and we title it Youth At Risk. The primary objective of this program is to work in the area of prevention and intervention to help young people facing risk conditions such as: drugs, poverty, lack of positive parent support, and peer pressure.

These are factors that manifest themselves in putting youth at risk. Based on current programs, we would work very closely with other community agencies in rural and urban areas and other youth serving organizations, to impact on the lives of these young people.

We have several models to draw from. We simply want to put this program in place on a broader scale across this country.

The program does have specifications in terms of some matching from the State partner. We are also getting firm indications of support from private sector resources to be a part of this program.

I can't overemphasize how excited we are about this program. We think it's very critical to the young people of this country, and to the future of this country in terms of the kind of people that we hire and replace others of us that move onto other things later in life.

FOOD SAFETY

We are requesting $2 million to strengthen our Food Safety Program. This is not a new program for us. We need to expand and strengthen it.

We want to particularly stress in the food safety area the notion of risk assessment. How do we teach people to understand that in terms of food safety you need to have some understanding of how you make a risk assessment about food quality and safety?

We are directing this effort at producers, handlers, and consumers. We think this is another critical issue area that really deserves more attention. We believe that the lack of understanding causes a lot of the concern amongst consumers and producers. We want to try to increase the understanding on what constitutes a safe and wholesome food supply.

1890 INSTITUTIONS

Consistent with our continuing effort within the Department and the Extension Service to strengthen the capacity of the 1890 Institutions and Tuskegee University, we have a $1.3 million increase proposed for those institutions.

Their focus, with these additional funds, would include: working with young people and the risks they're facing; the aging population; and the core programs.

These institutions do so well in targeting and working with the critical audiences that have limited resources. They have a special mission and are doing a fine job. We strongly endorse a $1.3 million increase.

PESTICIDE IMPACT ASSESSMENT

Pesticide impact assessment has been in our budget for quite some time. Last year we requested and received an increase. The reason being we are continuing to have to do more pesticide impact assessments.

The number of assessments has increased quite dramatically, about five- or six-fold in the past couple of years.

We're requesting a $1 million increase in the PIA program, and we have streamlined the way we go about doing the assessments. We now have a design that's going to be more effective and can accommodate the projected work load with the level of funding requested in the budget.

Lastly, with the change in the responsibilities and demands that are placed upon the Federal Extension Service within USDA, we are requesting a modest half million dollar increase for Federal Administration. This will allow us to do a better job in working with other Federal agencies and the State partner.

It's a relatively modest adjustment, but it's important in our operations.

EFNEP

In the area of the EFNEP Program, we're proposing funding at a $21.6 million level with matching from the States. Complementing this funding level will be a change in the way we operate the program that allows for more small group approaches rather than one on one. Additionally we would shorten and intensify the length of the training program for the clientele.

Some items, such as urban gardening, farm safety, farm financial management, RREA and Rural Development Centers are not included in this budget proposal.

That concludes my comments, Mr. Chairman.

URBAN GARDENING

Mr. **Whitten**. Thank you very much. We on this committee, all the members, have been very much interested and supportive of the Extension Service, and we still feel that way.

But I do find less and less interest back home. You heard me say earlier that I frequently get asked why in the world do I care so much about the urban gardening program.

They cut it out every year, and we have to restore it. I ask them how would you get the votes of members from Detroit, New York and Chicago?

Nutrition aids is another thing that we've been able to do through the years to get support from the cities and we have to have the support of the urban members.

Mississippi has five members of Congress, and New York City has 21. You can see what we're up against. I say for the record, they've been very supportive of our efforts, but it's hard for them to do if they don't see some signs of it benefiting their constituents.

One of the major problems that I see in the land grant colleges, we are very proud of them and they are wonderful institutions, is that agriculture is getting less and less interesting to their students. Primarily because we have very few young people going to agricultural colleges who are not the heirs or the coming heirs of farms.

The others are there to get a job like the rest of us where they do something else in the way of research and various and sundry other things.

I've always felt that Extension was the backbone. It's an educational program, and for the record, it gets its support from the Federal Government, the State, and usually the county.

But it's getting, so they tell us, to where with bigger and bigger operators they want an expert in this field and that field. A general practitioner or a general agricultural man is not as desired in areas where all the operations are big, where they want specialists in animals or specialists in this or specialists in that.

From time to time I've asked them what we can do to help. This committee is the one that sponsored the retirement program. They're not Federal employees under the rules of what an employee is, and we're the ones that promoted it where we did have a retirement system.

So we've been on their side all along.

I don't know what we can do. Now, we've insisted from time to time that we had to get on radio, television and sell this. Well, they gave us some time at about 6:30 a.m. and nobody's up but the farmer, and they're already all right.

We believe in it, so we work in trying to promote it, and most of the time we've had to restore funds for many of your programs.

4-H

I don't want to quit without saying something about the 4-H clubs.

We're very proud of them, and we're the ones that provided money for 4-H type work in your large cities to get them interested.

Where everything used to be farming and cooking, now it's all sorts of programs that appeal to the youngsters today. So we're trying to do our part, and I'm sure you are, but what are we going to do to make the folks back home realize the value that they have?

Is there anything that can be done that you're not already doing?

Dr. JOHNSRUD. Well, I'm sure there are some things that can be done that we aren't doing, Mr. Chairman, however one thing we are doing at the local level is encouraging the selection of people that are involved in the advisory committees with broadened interests so the system can get appreciation for its concerns.

The notion is that even if you aren't in the business of production agriculture, you ought to have an interest in and be related to it.

Mr. WHITTEN. I had some people talking to me the other day about enlisting 4-H clubs to talk about drugs. I said fine, but you won't find any of them using drugs.

By and large, there may be an exception somewhere, but I mean if they're active in 4-H, they're the right kind of youngsters to start with.

I'm glad to say that. Vocational education, when we came on this committee, was largely farming or working on tractors, et cetera. We changed that to where they studied to do a job.

From that, we've had the outgrowth of job training in the junior colleges, and the community colleges. So we are part of the background. I don't think it's your fault or our fault, but it's hard to know just how to go about calling attention to this need.

Dr. JOHNSRUD. Well, if I may say so, Mr. Chairman, the Youth At Risk proposal, and I didn't use the term 4-H there, we're talking about youth, and——

Mr. WHITTEN. Well, youth, I mean, it's——

YOUTH AT RISK

Dr. JOHNSRUD. It's beyond that, and you clearly remind me each year that in order to get some of these jobs done, we need a broad base of support.

I can say that the Youth At Risk proposal is focused clearly on both rural and urban. At the same time, when we went through developing the initiatives, we involved people from urban and rural areas in helping identify these areas.

It's a way to get a sensitivity and an input of what we ought to be focusing on. I think it's kind of a constant process in always being sensitive to our clientele needs.

Mr. **Whitten**. You've doubtless heard me tell it before. This committee has been largely responsible for rural water, rural electricity and other things where rural people have some of the benefits of city life.

I was on a program at 4-H headquarters several years ago and they had a young black fellow from Boston who had gotten a 4-H award and he said how glad he was he came, he said he didn't know rural people had 4-H.

So I'm very proud of the background and all the attention I've gotten for 4-H after I came up here. I didn't do that well when I was in it.

But it is fine, and it's good for these youngsters. Another thing aside from the point here, in the recent Drug Bill, we put money in there where they could take some of these excess military bases and turn them into camps like we had back in the Depression. CCC type camps, where they work in forestry and various other things. If we don't move some of these youngsters out of these crime ridden areas of our cities, we're going to lose a generation of young people.

So what I'm trying to say is that we need to do all we can to educate, but we also need to do something to put a stop to drugs.

The sky is the limit as to the good your teaching can do, and we're very much interested in that, and any suggestion you have that we could use to help, we'd be glad to do it.

FISCAL YEAR 1991 BUDGET

Let me now turn to some specific questions on your request. First, at this point in the record, would you please insert a copy of the table which appears on page 34 of the 1991 Budget Summary of the Department of Agriculture?

[The information follows:]

EXTENSION SERVICE (ES)—PROGRAM LEVEL

[Dollars in millions]

Program	1989 actual	1990 current estimate	1991 budget
General Formula Programs:			
Smith-Lever 3(b&c)	$241.6	$242.3	$246.5
1890 Colleges & Tuskegee University	18.3	21.8	23.1
D.C. Extension	1.0	0.9	1.0
Subtotal	260.9	265.0	270.6
Smith-Lever Section 3d Programs:			
National Interest Programs:			
Youth at risk	0.0	0.0	10.0
Water quality	1.5	5.2	15.5
Food safety	0.0	0.0	2.0
Low-income nutrition (EFNEP)	58.6	58.2	21.6
Pest management	7.2	7.1	7.2
Pesticide impact assessment	1.6	2.6	3.6
Special Interest Programs:			
Farm safety	1.0	1.0	0.0
Urban gardening	3.5	3.5	0.0
Financial management	1.4	1.4	0.0
Integrated reproductive managemnt	0.1	0.0	0.0

EXTENSION SERVICE (ES)—PROGRAM LEVEL—Continued

[Dollars in millions]

Program	1989 actual	1990 current estimate	1991 budget
Rural development centers	1.0	0.9	0.0
Subtotal	75.9	79.9	59.9
1890 extension facilities	9.5	9.5	9.5
Renewable Resources Extension	2.8	2.7	0.0
Section 1440 Grants	3.4	3.3	0.0
Federal admin. (direct approp.)	9.1	8.7	5.7
Total	361.6	369.2	345.7

Mr. WHITTEN. Using the same format as this table, would you please describe for the Committee the Extension Service's fiscal year 1991 budget request to the Department, the Department's request to the Office of Management and Budget and the OMB allowance?

[The information follows:]

EXTENSION SERVICE (ES)—PROGRAM LEVEL

[Dollars in millions]

Program	Agency request	Dept. request	OMB allowance
General Formula Programs:			
Smith-Lever 3(b&c)	$248.0	$248.0	$246.5
1890 Colleges and Tuskegee University	28.0	23.1	23.1
D.C. Extension	1.0	1.0	1.0
Subtotal	277.0	272.1	270.6
Smith-Lever Section 3d Programs:			
National Interest Programs:			
Youth at risk	10.0	10.0	10.0
Water quality	24.0	15.5	15.5
Food safety	6.0	3.0	2.0
Low-income nutrition (EFNEP)	48.0	48.0	21.6
Pest management	7.2	7.2	7.2
Pesticide impact assessment	3.6	3.6	3.6
Rural revitalization	11.0	2.0	0.0
Commercial ag. tech. system	1.0	0.0	0.0
Global change	4.0	0.0	0.0
Agricultural health and safety	7.0	1.0	0.0
Special Interest Programs:			
Farm safety	0.0	0.0	0.0
Urban gardening	3.5	3.5	0.0
Financial management	0.0	0.0	0.0
Integrated reproductive management	0.0	0.0	0.0
Rural development centers	0.0	0.0	0.0
Subtotal	125.3	93.8	59.9
1890 extension facilities	10.0	9.5	9.5
Renewable Resources Extension	5.0	0.0	0.0
Section 1440 Grants	0.0	0.0	0.0

EXTENSION SERVICE (ES)—PROGRAM LEVEL—Continued

[Dollars in millions]

Program	Agency request	Dept. request	OMB allowance
Federal admin. (direct approp.)	7.0	6.0	5.7
Total	424.3	381.4	345.7

ESTIMATED STAFF REDUCTIONS

Mr. WHITTEN. Compared with the funds available for fiscal year 1990, how many Extension staff positions would be eliminated if the budget reductions you propose for fiscal year 1991 were agreed to by the Congress? You might provide for the record a table similar to the table which appeared on page 529 of last year's hearing record.

[The information follows:]

ESTIMATED STAFF REDUCTIONS

Program	Professional staff	Paraprofessional staff	Total reductions
EFNEP	100	900	1,000
Urban Gardening	44	90	134
Farm Safety	20		20
RREA	161		161
Rural Development Centers	12		12
Total	337	990	1,327

Mr. WHITTEN. Would you also provide for the record a similar table that would show any proposed staffing increases by program?

Dr. JOHNSRUD. The increases in the fiscal year 1991, Smith-Lever 3d programs, are allocated to Water Quality and Youth-at-Risk. Any staffing increases would be determined by the States.

ON-FARM ASSISTANCE

Mr. WHITTEN. How much of the total Extension Service budget in fiscal year 1991 is devoted to helping farmers solve "on-farm" problems and how much is devoted to other activities of the Cooperative Extension Service?

Dr. JOHNSRUD. I would use as a definition of "on-farm" to mean Extension programs for producers, whether farmers or ranchers. Within this context between 50 and 60 percent of Extension's budget will be devoted to these types of programs.

REIMBURSEMENTS FROM OTHER FEDERAL AGENCIES

Mr. WHITTEN. According to page 9-3 of the notes, during fiscal year 1991 you anticipate receiving $1.9 million from the Agency for International Development for international extension work. Would you please provide for the record a list of the countries and the type of work that is involved?

[The information follows:]

Country	Type of work
Guatemala	Cooperative Strengthening Project; Research and Extension.
Honduras	Small Farmer Coffee Improvement/Credit; Natural Resources.
Kenya	Regional Agriculture/Natural Resources.
Malawi	Ministry of Agriculture/Training.
Morocco	Agricultural Planning, Economic Analysis and Statistics.
Nigeria	International Institute of Tropical Agriculture.
Somalia	Field Veterinary Services; Feedlot Management.
Thailand	Monitoring of Global Environment.
AID Worldwide	Pest Management.

Mr. WHITTEN. Why do you anticipate $100,000 reduction in this program in 1990 compared to fiscal year 1989?

Dr. JOHNSRUD. Due to the sequestration in FY90, our authority to receive reimbursable funds was reduced in this program from $2.0 million in FY89 to $1.9 million in FY90.

REIMBURSEMENTS FROM OTHER FEDERAL AGENCIES

Mr. WHITTEN. You also anticipate that you will receive $1,862,000 from the EPA for pesticide applicator training. Would you please describe for the Committee the Extension Service role in this program?

Dr. JOHNSRUD. These funds are used to provide training to approximately 600,000 private and commercial pesticide applicators per year. The Extension Service develops educational materials and delivers educational programs on as many as 23 specific applicator categories nationally.

OBLIGATIONS UNDER OTHER USDA APPROPRIATIONS

COLORADO RIVER BASIN SALINITY CONTROL PROGRAM

Mr. WHITTEN. According to page 9-2 of the notes, you will be receiving $546,000 from ASCS for the Colorado River Basin Salinity Control Program. Please describe your role in connection with this program.

Dr. JOHNSRUD. The Extension Service assisted ASCS and SCS in developing the rules and regulations to implement the Colorado River Salinity Control Program (CRSCP). The Extension Service, through the State Cooperative Extension Services, provides education and information programs to create farmer awareness, interest, and participation in the CRSCP. Specific activities of Cooperative Extension in the CRSCP projects have included workshops, short courses, informational meetings, publications, tours, demonstrations, and newsletters for producers and other agency personnel. These program efforts complement and facilitate the roles of SCS and ASCS, and result in the on-farm adoption of practices to reduce salt loadings into the Colorado River.

RURAL CLEAN WATER PROJECT

Mr. WHITTEN. You will also receive $420,000 from ASCS for work in connection with the rural clean water project. Please describe the work the Extension Service does in connection with this project.

Dr. **Johnsrud**. As in the CRSCP, the major role of ES in the Rural Clean Water Program (RCWP) is that of providing education and information programs. Additionally, in the RCWP, ES has assumed technical responsibility for several Best Management Practices, including Soil Fertility, Pesticide Management, and Animal Waste Management. Some of the specific activities of Extension in the RCWP projects in 1989 included assistance to farmers in developing Nutrient Management plans and Integrated Pest Management plans as well as educational programs on now to implement the plans. Training has been conducted in soil and manure sampling and analysis, manure spreader calibration, and field scouting for pests. In addition, field demonstrations, tours, newsletters, short courses, and radio and newspaper publicity were used to increase participation in the RCWP projects and to encourage all farmers in the project areas to adopt appropriate Best Management Practices.

URBAN GARDENING PROGRAM

Mr. **Whitten**. Please provide for the record a five-year table for the urban gardening program showing the number of participants and volunteers.

[The information follows:]

Numbers of participants and volunteers in the urban gardening program during the past years are as follows:

	Participants	Volunteers
Fiscal Year		
1985	222,777	3,071
1986	225,466	3,690
1987	199,357	3,857
1988	188,243	3,007
1989 [1]	171,338	3,185

[1] Data from two States are not available at this time

Mr. **Whitten**. Last year you advised the Committee that the programs in Jacksonville, Atlanta, Los Angeles, and New Orleans had experienced significant changes and that the total number of participants should increase as these programs regain their momentum. Has this increase occurred?

Dr. **Johnsrud**. Last year I advised the Committee that reorganizations were occurring in Jacksonville, Atlanta, Los Angeles, and New Orleans; and as a consequence, the program would be better in these cities. I will provide data for the record from FY89 compared to FY88 for the four cities.

[The information follows:]

	Participants	Production
Fiscal Year		
1988	8,379	$2,284,464
1989	10,735	5,644,447

Mr. **Whitten**. To what extent is the decline in participation in the urban gardening program attributable to morale problems created by the Administration proposing to terminate this program each year?

Dr. JOHNSRUD. The decline in participation in the urban gardening program could be attributed to the uncertainty of funding but the extent of this cannot be determined.

VALUE OF FOOD PRODUCED

Mr. WHITTEN. What is the total value of the food produced under the urban gardening program each year for the past five years?

[The information follows:]

Fiscal year:	*Estimated value*
1985	$20,565,000
1986	16,760,584
1987	17,615,000
1988	16,945,850
1989 [1]	21,506,313

[1] Data from two States is not available.

URBAN GARDENING CITIES

Mr. WHITTEN. Please provide for the record a list of cities where the urban gardening program now operates and the budget for each city. Also provide the amount of non-Federal funds that these cities receive for their urban gardening programs.

[The information follows:]

City and State	Fiscal year 1989 ES funds	Non-Federal funds
Phoenix, AZ	$106,500	$6,000
Los Angeles, CA	238,000	338,000
Denver, CO	95,000	230,000
Bridgeport, CT	71,500	11,000
Jacksonville, FL	142,500	15,800
Atlanta, GA	142,500	27,192
Honolulu, HI	100,000	([1])
Chicago, IL	286,000	5,117
Indianapolis, IN	106,500	2,300
Louisville, KY	71,000	0
New Orleans, LA	142,500	6,896
Boston, MA	142,500	([1])
Baltimore, MD	142,500	6,800
Detroit, MI	142,500	70,600
St. Louis, MO	142,500	3,500
Newark, NJ	142,500	134,872
New York, NY	478,000	41,500
Cleveland, OH	142,500	71,000
Philadelphia, PA	142,500	300,000
Memphis, TN	142,500	28,000
Houston, TX	142,500	22,200
Seattle, WA	95,000	19,660
Milwaukee, WI	142,500	96,300
Total	3,500,00	1,437,537

[1] NA—Not available.

URBAN GARDENING STAFF

Mr. WHITTEN. How many people employed by the Extension Service are assigned to the urban gardening program, by city?

[The information follows:]

City and State	*FTE's*
Phoenix, AZ	8.0
Los Angeles, CA	5.6
Denver, CO	5.0
Bridgeport, CT	1.5
Jacksonville, FL	10.0
Atlanta, GA	6.0
Honolulu, HI	(1)
Chicago, IL	8.5
Indianapolis, IN	4.0
Louisville, KY	5.2
New Orleans, LA	7.3
Boston, MA	(1)
Baltimore, MD	0.8
Detroit, MI	6.0
St. Louis, MO	8.0
Newark, NJ	14.0
New York, NY	7.6
Cleveland, OH	5.7
Philadelphia, PA	9.4
Memphis, TN	4.6
Houston, TX	5.5
Seattle, WA	5.0
Milwaukee, WI	7.0
Total	134.7

[1] NA—not available.

Mr. WHITTEN. At this point in the record, would you insert a copy of the Urban Gardening Report which was requested by the Committee?

Dr. JOHNSRUD. The Urban Gardening Program Report is not available at this time. States are still collecting and submitting data. The report should be available shortly and will be provided to the Committee as soon as possible.

RURAL DEVELOPMENT CENTERS

Mr. WHITTEN. We note that again you are proposing to terminate the Rural Development Centers. How does the proposed termination of these Centers fit in with the Administration's new "Rural Development Initiative"?

Dr. JOHNSRUD. The Rural Development Centers and regional programming were not mentioned in "Rural Economic Development for the 90's—A Presidential Initiative" released last January. The President's Initiative utilized other ongoing program structures to address Rural Development issues.

RURAL DEVELOPMENT CENTER FUNDING

Mr. WHITTEN. Would you please provide for the record a table indicating how each of the Rural Development Centers allocated their funds in fiscal years 1988, 1989 and 1990, similar to the table which appears on page 534 of last year's hearing record?

[The information follows:]

	Fiscal year—		
	1988	1989	1990
North Central Regional Center for Rural Development:			
Personnel	$48,000	$51,000	$58,000
Travel and Subsistence	59,000	59,000	49,000
Publications (Educational Materials)	64,000	58,000	63,647
Current Expenses	13,290	18,290	16,000
Computer	5,000	3,000	1,290
Total	189,290	189,290	187,937
North Dakota Institute for Business and Industry Development:			
Personnel	112,973	139,750	133,676
Travel	14,500	13,000	——
Operating Expenses and Supplies	9,807	29,650	——
Trade Area Analysis	——	——	22,416
Contract Roosevelt Custer Regional Center	——	——	25,000
Total	137,280	182,400	181,092
Northeast Regional Center for Rural Development:			
Personnel	37,500	41,000	43,000
Travel	15,000	15,000	14,647
Equipment and Supplies	8,000	8,000	8,000
Other Operating Expenses	128,790	125,290	122,290
Total	189,290	189,290	187,937
Southern Rural Development Center:			
Personnel	80,591	80,591	82,375
Travel	10,000	18,000	18,000
Other (Fringe Benefits)	13,107	13,877	19,770
Equipment	10,000	——	——
Contractual Services	60,000	60,000	55,741
Commodities	15,592	16,822	12,051
Total	189,290	189,290	187,937
Western Rural Development Center:			
Personnel	106,873	104,778	90,927
Travel	18,000	14,000	14,000
Equipment	3,000	1,000	1,500
Other Expenses	15,000	18,778	15,000
Other Operating Expenses	46,417	50,734	66,510
Total	189,290	189,290	187,937

LOCATION

Mr. WHITTEN. Would you also indicate for the record where these Centers are located?

Dr. JOHNSRUD. The Northeast Regional Center for Rural Development is located at the Pennsylvania State University, University Park, Pennsylvania. The Southern Rural Development Center is located at Mississippi State University, Mississippi State, Mississippi. The North Central Regional Center for Rural Development is located at Iowa State University, Ames, Iowa. The Western Rural Development Center is located at Oregon State University, Corvallis, Oregon. The North Dakota Institute for Business and Industry Development is located at North Dakota State University, Fargo, North Dakota.

ACCOMPLISHMENTS

Mr. WHITTEN. Would you please provide for the record some of the accomplishments of these Centers during the past year?

Dr. JOHNSRUD. The four Regional Rural Development Centers encourage and conduct research and Extension programs designed to improve the social and economic well-being of nonmetropolitan communities in their respective regions. The purpose of the North Dakota Center is to develop a broad range of educational and applied research programs to enhance North Dakota's human and economic potential. Coordination of science and education programs among and between states in a region results in relevant answers to realistic rural problems.

Each Regional Center operates distinct programs impacting on the specific needs of its region, but they also respond collectively to national issues. For instance, the Western Rural Development Center has an Impact of Planning (IMPLAN) project that is part of a national effort to explore the potential for IMPLAN to meet Extension Service needs. At the National IMPLAN Extension Training Workshop held in 1988, four regional user groups were set up to facilitate the sharing of information, applications and assistance among specialists within Extension regions. IMPLAN, an input-output model and database system, permits examination of more than 500 economic sectors; it is now in 40 states. The Centers also support all of the Extension System's National Initiatives, emphasizing Revitalizing Rural America and Water Quality. The Director of the Southern Rural Development Center was chairman for the conference on "Revitalizing the Rural South—Extension's Role in Enhancing the Quality of Life" in 1990. The Northeast Regional Center for Rural Development has continued its high level concern with water quality. It has funded a number of regional efforts targeting water quality and was instrumental in organizing the Policy Working Group on Groundwater Quality. The North Central Regional Center for Rural Development sponsored a successful "Empowering Rural Communities" conference attended by 158 during 1989. The focus of the conference was to provide Extension staff and others with powerful skills and tools for assisting rural communities. Building local capacity to better organize and make more informed decisions about economic and community development was emphasized. The North Dakota Center has conducted a trade area analysis. More than 50,000 questionnaires were mailed with about 20,000 returned. A study of more than 300 export-oriented, growing businesses in Nebraska and North and South Dakota was completed.

FUNDING

Mr. WHITTEN. Would you please provide for the record a table which starts with the inception of these Centers and shows, for each fiscal year, the amount requested in the President's budget for the Centers and the amount appropriated by Congress?

[The information follows:]

RURAL DEVELOPMENT CENTER FUNDING

	Amount requested in Presidential Budget	Amount appropriated by Congress
Fiscal year:		
1974	0	$150,000
1975	0	150,000
1976	0	187,500
1977	0	150,000
1978	0	250,000
1979	0	250,000
1980	0	250,000
1981	0	250,000
1982	0	400,000
1983	0	400,000
1984	0	500,000
1985	0	500,000
1986	0	689,000
1987	0	689,000
1988	0	[1] 903,000
1989	0	950,000
1990	$950,000	[2] 943,000

[1] First year of funding for North Dakota Rural Development Center.
[2] Includes sequestration of funds under Gramm-Rudman-Hollings Act.

1890 EXTENSION FACILITIES

Mr. WHITTEN. Would you please provide for the record details on how the $9,508,000 appropriated in fiscal year 1990 for 1890 facilities will be used?

Dr. JOHNSRUD. Fiscal Year 1990 is the third year of a planned five-year program to provide funds to the 1890 Institutions and Tuskegee University for the improvement and acquisition of Extension facilities and equipment. Funds awarded in FY 1990 will continue to be used for the planning, renovation, and construction of Extension Facilities and for the purchase of necessary equipment to outfit these facilities.

OTHER SERVICES ACCOUNT

Mr. WHITTEN. In connection with the table on page 9-5 of the notes, which shows an Other Services account of $1.2 million for fiscal year 1991, would you please provide a sub-object class breakdown for the record?

[The information follows:]

EXTENSION SERVICE OTHER SERVICES ACCOUNT

[In thousands of dollars]

	1989	1990	1991
Object class:			
USDA Central Charges	193	230	260
Registration Fees	157	145	130
Training	89	90	90
USDA Computer Costs	73	95	120
Non-Travel Reimbursable Expenses	37	40	30
Special Projects with States	453	400	330
Miscellaneous	63	50	40
Total	1,065	1,050	1,000

FARM SAFETY PROGRAM

Mr. WHITTEN. You are proposing to discontinue the farm safety program. Would you describe for the Committee the work that has been done under this program to date.

Dr. JOHNSRUD. Since its inception, the Cooperative Extension System has developed educational programs to address agricultural health and safety issues. Work has been done to educate farmers on how to reduce their exposure to occupational health hazards such as noise, farm chemicals, respiratory illnesses, and cancer and prevent farm accidents in working with tractors, machinery, livestock and farm structures, and reduce the severity of the injuries through correct rescue and emergency procedures.

I will provide some specific examples for the record.

[The information follows:]

According to the National Safety Council, farm accident death rates have dropped from 56/100,000 workers in 1980 to 48/100,000 workers in 1988, a 1 percent decrease.

CES programs have been effective in increasing the use of protective clothing to reduce exposure to farm chemical, respiratory and noise hazards. True benefits to accrue in future calculations.

Of the 23,000 Nebraska youth who have received Extension tractor training certification since 1968, only two have died in tractor related accidents—none since 1970.

More than half the state extension systems allocated resources to farm safety in excess of their federal allocations.

Purdue University's "Breaking New Ground Resources Center" has provided rehabilitation and handicap services to over 75 Indiana farmers in 1989.

Over 16,000 Emergency Medical Technicians, emergency room health professionals and farm family members have received specialized training on extrication and emergency procedures for farm accident victims in more than 30 states.

Mr. WHITTEN. How long has this program been funded and how much has been appropriated through fiscal year 1990?

Dr. JOHNSRUD. This program has been funded since 1975 at approximately $1,000,000 each year through fiscal year 1989. $963,000 was appropriated for fiscal year 1990.

Mr. WHITTEN. In what States is this program conducted?

Dr. JOHNSRUD. This program has been conducted in all fifty states and Puerto Rico.

FINANCIAL MANAGEMENT

Mr. WHITTEN. You are proposing to discontinue the financial management program. Would you please describe the work that has been done under this program.

Dr. JOHNSRUD. Assistance has been provided for farm families on farm financial management problems by funding on a competitive basis a series of special projects throughout the country. This assistance has helped farm families to analyze their own individual financial management problems, make decisions, and take actions in dealing with these problems. Farm families have been assisted in the development of farm management plans and farm financial statements. The financial statements have often been used with lenders in developing loan arrangements, and the revised farm plans have often assisted the farmer in achieving increased levels of income. State Extension Services have utilized one-on-one intensive counseling on most projects, hotlines, counseling centers, intensive group workshops, video training tapes, computer-assisted instruction, and training of other organization staff who in turn provided assistance to farmers. Some projects have been funded to develop educational materials including computer programs which have been distributed to all State Extension Services.

Mr. Whitten. How long has this program been underway and how much has been appropriated through fiscal year 1990 specifically for this program?

Dr. Johnsrud. Since the FY85 original appropriation, a total of 117 projects have been funded involving 39 states, Micronesia and Puerto Rico. Plans are underway to fund approximately 30 additional projects with the FY90 funds. It is expected the projects to be funded with FY90 funds will involve projects from 5 additional states which had not previously had projects funded. A breakdown of the appropriation and number of projects funded by year will be provided for the record.

[The information follows:]

FINANCIAL MANAGEMENT

[Dollar amounts in millions]

	Amount	Number of projects
1985	$1.0	18
1986	1.4	20
1987	1.4	23
1988	1.4	25
1989	1.4	31
1990	1.4	[1] 30

[1] Estimate

RENEWABLE RESOURCES EXTENSION

Mr. Whitten. You are proposing to discontinue the renewable resources extension program again this year. Would you please describe the work that has been carried out under this program?

Dr. Johnsrud. The renewable resources extension program has been very broad in its scope and application. Areas of impact have included the educational aspects of forest lands management, riparian areas management, grazelands management, pasture management, youth and public wildlands programs, and fisheries and wildlife management programs.

Among the accomplishments of note include educational programs in Alabama, Arkansas, California, Idaho, Mississippi, and Tennessee which reached 17,000 citizens. The short course "Profitable Harvesting and Marketing of Timber" alone, has been given to 250 landowners in Mississippi in the past 3 years.

Mr. Whitten. How long has this program been underway?

Dr. Johnsrud. The legislation authorizing the program was passed in 1978. Initial funding for the program was received in 1982.

Mr. Whitten. Since you generally propose to discontinue this program, will you also propose that the authorization for the program be stricken in connection with development of the 1990 Farm Bill?

Dr. **Johnsrud**. Our 1990 Farm Bill proposals do not include provisions to eliminate the renewable resources extension authorization.

TECHNOLOGY TRANSFER PROJECT

Mr. **Whitten**. For the Technology Transfer Project, which is funded under Federal Administration, would you please describe for the record the work that has been done under this program to date?

[The information follows:]

The Technology Transfer project involves work at both Mississippi State and Oklahoma State Cooperative Extension.

At Mississippi State the program involves: Demonstration to Local Governments, Small Business and Industry Assistance, Information Management Through Networks, Computerized Crop Modeling Through Expert Systems, and Technology Utilization from Federal Laboratories.

The Technology transfer efforts at Oklahoma State are to:

1. Identify business and industrial classes with a significant decline in competitiveness due to:

(a) Influx of foreign competition.

(b) Raw material and process inputs of the industry becoming increasingly scarce and expensive (i.e., energy, labor, pollution control requirements).

2. Disseminate of state-of-the-art reports to business, industry, entrepreneurial groups, and the financial community in Southeastern Oklahoma which represent the source of commercialization of one or more of the technologies identified. Assist individual businesses and industries to solve specific technical problems.

3. Identify organizations and associations that can assist in the commercialization/innovation process (Rural Enterprises and others).

4. Monitor private sector activity in Southeastern Oklahoma for commercialization or implementation of technologies identified through the program.

Mr. **Whitten**. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. **Johnsrud**. This project has been funded since 1983 at approximately $330,000 each year through fiscal year 1990, for a total of over $2.6 million.

FARM FINANCIAL MANAGEMENT PROJECT

Mr. **Whitten**. For the Farm Financial Management Project, which is funded under Federal Administration, would you please describe the work that has been done to date?

Dr. **Johnsrud**. The Nebraska Farm Finanical Management Project, now called Managing Main Street Business, is in its third year of operation. This program cooperates with the Nebraska Business Development Centers throughout Nebraska in delivering management assistance to rural businesses. The program consists of six evening workshops which cover marketing, business planning, financial analysis and planning, goal setting and skills in dealing with people.

Mr. **Whitten**. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. **Johnsrud**. This project has been funded since 1985 at approximately $189,000 each year through fiscal year 1990, for a total of about $1.1 million.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Johnsrud**. This program is being carried out at Nebraska Business Development Centers throughout Nebraska.

RURAL DEVELOPMENT PROJECT

Mr. WHITTEN. For the Rural Development Project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. Modernizing America's industrial base and providing outlets for U.S. entrepreneurship are the goals of Rural Enterprises which is the recipient of this appropriation. Rural Enterprises has these activities in place: a data retrieval capability tied into NASA bases and to the Federal Laboratory Consortium; capability to evaluate promising innovation from the technical and market perspective; access to university expertise for additional technical and marketing capability; development of financial support opportunities for enterpreneurs; and management of intellectual property.

Mr. WHITTEN. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. JOHNSRUD. This project has been funded since 1982 at approximately $430,000 each year through fiscal year 1990, for a total of over $3.8 million.

Mr. WHITTEN. Where is this work being carried out?

Dr. JOHNSRUD. This project is being carried out at Rural Enterprises, Inc., Durant, Oklahoma.

CRAMBE AND RAPESEED

Mr. WHITTEN. For the crambe and rapeseed project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. Crambe test sites were conducted for variety trials, herbicide trials, and row spacing and plant population trials. A winter rapeseed variety trial was also planted. An electronic information bulletin board was established for persons interested in the commercialization of crambe and rapeseed for industrial or other uses. Foundation seed was grown, cleaned, and prepared for sale. Work was accomplished toward label clearance for herbicide treflan on crambe. Research on product use was evaluated.

Mr. WHITTEN. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. JOHNSRUD. This project has been funded since 1988 at approximately $64,000 each year through fiscal year 1990, for a total of about $192,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JOHNSRUD. This work is being carried out in Nebraska in cooperation with work in eight other states.

AMERICAN PACIFIC PROJECT

Mr. WHITTEN. For the American Pacific project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. In the three years that the project has existed, it has allowed the partners in this region to get organized, develop plans, establish priorities and start addressing some of the challenges we have spoken about. The project allows additional goals to be achieved without drawing on the base funding provided for the ongoing programs. Areas of work include, pesticide usage and pest control, marketing and program delivery.

Mr. WHITTEN. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. JOHNSRUD. The project was first funded in 1988. It has received $650,000 a year for the last three years, for a total of $1,950,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JOHNSRUD. The work is focused at the University of Hawaii, with additional efforts in Guam, American Samoa, Micronesia and the Northern Marianas.

NEW ENGLAND VERTEBRATE PROJECT

Mr. WHITTEN. For the New England Vertebrate Project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. An Extension Advisory Steering Committee and a Working Group within the New England area, Massachusetts, Maine, New Hampshire, and Vermont has been established. The Working Group involved personnel from the respective States from a variety of agencies and organizations including: Extension; APHIS-ADC, USDA; State Department of Agriculure and appropriate Land Grant Universities.

Meetings of both the Steering Committee and the Working Group have taken place and several educational meetings have been conducted with clientele groups who have animal damage problems. A survey of animal damage control representatives has been conducted to ensure that needs and issues discussed by the Working Group accurately reflected the opinions and concerns of field and agency personnel. Access to INFONET, an electronic communications and computer date transfer system, has been established for all members of the Working Group to improve networking and communications.

A new leaflet series on animal damage control programs in the region is being developed and a number of field demonstrations of electric fencing techniques, guard dogs for livestock operations, and bird control techniques for municipalities are planned during 1990. In addition, an effort is underway to provide a library of animal damage control videotapes for use by agency personnel and producers.

Mr. WHITTEN. How long has this project been funded?

Dr. JOHNSRUD. This project was first funded in 1990 for $94,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JOHNSRUD. Primarily in the States of Massachusetts, Maine, Vermont, and New Hampshire, however, many of the publications, video-tapes and demonstration projects will have applicability for other States in the Northeast.

RURAL REVITALIZATION PROJECT

Mr. WHITTEN. For the Rural Revitalization project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. Project Future Community Self Renewal is a demonstration pilot of a comprehensive community development program for citizen leaders to define their "community of the future." The program includes extensive public involvement projects. Five sites have completed a complex issue identification and community engagement effort. Thirty citizen action teams have been formed and are working with universities and state agencies to implement identified community programs. Ten additional communities are in the start up phase.

A statewide database of planning information has been developed, and a training package for community development professionals to learn "Project Future Community Self Renewal" is available. National dissemination of the program is planned.

Mr. WHITTEN. How long has this project been funded and how much has been appropriated through fiscal 1990?

Dr. JOHNSRUD. This project has been funded since 1989 at approximately $137,000 each year through fiscal 1990, for a total of $274,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JOHNSRUD. This work is being carried out at the University of Minnesota Extension Service, University of Minnesota, St. Paul, Minnesota.

RURAL EDUCATION MODEL PROJECT

Mr. WHITTEN. For the Rural Education Model project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. A multi-agency North Dakota Rural Health Education Project Board was established to guide and coordinate development of this project. An "interactive video classroom site preparation manual" has been prepared.

Equipment has been purchased and four interactive video classroom sites have been established and successfully field tested, and eight more classroom sites have been recommended to the North Dakota State Board of Higher Education. A set of classroom criteria for interactive video sites has been developed, including classroom requirements and human requirements. Three academic units participating in formal classroom instruction are Social Work, Nursing, and Medical Technology. Each academic unit has developed a five year plan for the classes to be taught via interactive video, and each is actively recruiting students.

It is expected that formal classroom instruction via interactive video will begin with the fall semester, 1990.

Mr. WHITTEN. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. JOHNSRUD. This project has been funded since 1989 at approximately $846,000 each year through fiscal year 1990, for a total of about $1.7 million.

Mr. WHITTEN. Where is this work being carried out?

Dr. JOHNSRUD. Four North Dakota interactive video classroom sites are established at the University of North Dakota, Grand Forks; North Dakota State University, Fargo; the NDSU Research Extension Center, Carrington; and the Jamestown State Hospital, Jamestown. Eight additional sites—at state institutions of higher education—Bismarck, Bottineau, Mayville, Minot, Valley City, Whapeton, and a second classroom each at UND and NDSU—have been recommended and submitted to the State Board of Higher Education for approval.

DOCUMENTARY FILMS ON AMERICAN AGRICULTURE PROJECT

Mr. **WHITTEN**. For the Documentary films on American Agriculture project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. **JOHNSRUD**. The Hudson River Film and Video Company has been working on these films for the past two years. They are now in the final phases of the first program focused on the present and future of American agriculture. They are planning to complete editing of this program in the spring of 1990. The second program, focused on the history of American agriculture, is currently in the planning stages and they expect to film in late spring and early summer with editing to be completed throughout the summer and fall.

Mr. **WHITTEN**. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. **JOHNSRUD**. This project has been funded since 1989 at approximately $174,000 each year through fiscal year 1990, for a total of $348,000.

Mr. **WHITTEN**. Where is the work being carried out?

Dr. **JOHNSRUD**. The scripting and editing is being done by the Hudson River Film and Video Company in Garrison, New York. In addition, they have filmed in New Jersey, Pennsylvania, Ohio, West Virginia, Indiana, Illinois, Iowa, Wyoming, South Dakota, Minnesota, Wisconsin and Mississippi.

CROP SIMULATION PROJECT

Mr. **WHITTEN**. For the Crop Simulation project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. **JOHNSRUD**. The crop simulation project involves GOSSYM-COMAX which is the result of over 15 years of collaboration among many organizations. The joint venture has been led by USDA-Agricultural Research Service, Clemson University (SCAES), and Mississippi State University (MAFES). Extension Service-USDA, ARS, SCAES, and MAFES have agreed to work together to continue the beltwide implementation of GOSSYM-COMAX based upon positive responses received from a 1986-88 pilot effort. This three-year pilot was jointly funded by ARS, ES, States, and the Cotton Council. The purpose of the project was to extend GOSSYM-COMAX to a broader base of growers.

For the 1989 growing season, the GOSSYM-COMAX Information Unit (GCIU) was established. Expenses were shared by ARS and ES to employ two full-time people to function in the GCIU for the 1989 growing season. There is an opportunity to enhance our efforts to allow American farmers to take advantage of U.S. developed technologies in such a way that they can remain more competitive in a global market place. A general goal is expediting the use of this modern research technology.

Mr. WHITTEN. How much has been appropriated through fiscal year 1990?

Dr. JOHNSRUD. This project was first funded in 1990 at $496,000.

Mr. WHITTEN. Where is the work being carried out?

Dr. JOHNSRUD. The GOSSYM-COMAX decision support system is being offered to all cotton producing states. The following states are currently active participants: Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas.

RURAL REHABILITATION PROJECT

Mr. WHITTEN. For the Rural Rehabilitation Project, which is funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. The purpose of this project is to develop and apply technology innovations in which satellite-based instruction and video teleconferencing are integrated to yield a teaching approach that makes feasible the effective delivery of literacy training in rural areas in Georgia.

A satellite-based literacy training program has been developed and three class sessions have been conducted and evaluated. Students for these classes were recruited and evaluated locally, with assistance from the State Division of Rehabilitation Service.

Based on the model program, it is planned to bring students from a second grade reading level to a seventh grade reading level during their participation in the project.

Mr. WHITTEN. How long has this project been funded and how much has been appropriated through fiscal year 1990?

Dr. JOHNSRUD. This project has been funded since 1989 at approximately $256,000 each year through fiscal year 1990, for a total of $512,000.

Mr. WHITTEN. Where is this work being carried out?

Dr. JOHNSRUD. This project is headquartered at the Georgia Institute of Technology, Atlanta, Georgia. Adult literacy instruction for physically and educationally handicapped persons is given at Georgia Tech; Georgia Southern College, Statesboro, Georgia; and Albany State College, Albany, Georgia. Plans are underway to add the 23 Georgia Vocational Technical Schools to the satellite literacy training network.

PRESQUE ISLAND PROJECT

Mr. WHITTEN. For the Presque Island Project, which if funded under Federal Administration, would you please describe the work that has been done under this program to date?

Dr. JOHNSRUD. The Presque Island Project is only now getting underway. Funds will be used to provide capital improvements to this facility.

Mr. WHITTEN. How much has been appropriated through fiscal year 1990?

Dr. **Johnsrud**. This project was funded in 1990 at approximately $139,000.

Mr. **Whitten**. Where is this work being carried out?

Dr. **Johnsrud**. The funds were provided to the University of Maine Cooperative Extension Service in conjunction with the Presque Island Research facility.

SMITH-LEVER FUNDS

Mr. **Whitten**. On page 9-12 of the notes you state that Smith-Lever formula funds have not kept pace with inflation in contrast to state funding. Would you please provide for the record a ten-year table for Smith-Lever funds showing the amount requested in the President's budget each year and the amount appropriated by Congress?

[The information follows:]

Smith-Lever 3B&C

[Dollars in thousands]

	Presidents' budget	Actual appropriation
1982	$214,259	$219,376
1983	219,376	230,376
1984	230,376	234,984
1985	241,484	241,484
1986	241,484	241,484
1987	127,547	229,713
1988	237,594	241,594
1989	228,483	241,594
1990	241,594	244,094
1991	246,535	....

Mr. **Whitten**. You are requesting an increase of $10,289,000 for the water quality program. Would you please describe for the record how the $5.2 million that is available for fiscal year 1990 will be used?

[The information follows:]

Area of Emphasis	*Amount*
Demonstration projects (8)	$900,000
Non-point source hydrologic unit areas (37)	1,700,000
Improving Program Support Capabilities	1,750,000
Data base development, Midwest Initiative, Special Projects	444,000
Program development, ES support program	417,000
Total	5,211,000

Mr. **Whitten**. How will the additional funds be used?

Dr. **Johnsrud**. We propose to initiate eight more demonstration projects and 37 new Non-Point Source Hydrologic Unit Areas and essentially double the allocations to those projects initiated in FY 1990. We propose to double the level of support for improving program support capabilities and to increase allocations for data base development, the Midwest Initative, and special projects. Additionally, funds will be used for Regional Initiative Projects, and program development projects.

WATER QUALITY DEMONSTRATION PROJECTS

Mr. WHITTEN. Would you please list for the record and briefly describe the eight demonstration projects that are currently underway?

[The information follows:]

We are in the process of implementing demonstration projects in California, Florida, Maryland, Minnesota, Nebraska, North Carolina, Wisconsin and Texas. [A brief description of each of the projects follows:]

California.—The primary focus of the demonstration project is on practices to reduce and/or eliminate rice pesticides in tailwaters being directed into public waterways as well as the potential effects on groundwater in the Sacramento River basin.

Florida.—This project will demonstrate water, nutrient and pesticide management practices to reduce contamination to both shallow groundwater and surface runoff in the Lake Manatee watershed in Manatee county.

Maryland—The project will be implemented in subbasins of the Monocacy River watershed in parts of Frederick, Montgomery and Carroll Counties. Emphasis will be placed on demonstrating practices that reduce agricultural non-point source loadings from pesticides, nutrients (both chemical fertilizers and animal wastes) and soil erosion of both ground and surface water.

Minnesota—This projects is in the Anoka Sand Plain area of the east central and central part of the State. The project will focus on agricultural production practices that reduce non-point sources of nutrients and pesticides. These practices will include best management practices for both irrigation of non-irrigation production systems.

Nebraska.—This project is being implemented in Mid-Nebraska, primarily in Clay, Fullmore, Hamilton, Seward and York Counties. The primary objectives of this project are to demonstrate agricultural production practices and that reduce non-point source nutrient concern and pesticide loadings to ground and surface waters. The primary nutrient is nitrogen. The demonstration will address both irrigated and non-irrigated production systems.

North Carolina.—The project is being implemented in Duplin County on the watershed of Herring Marsh Run. The objectives of the project are to demonstrate agricultural production and animal waste management systems that reduce and or eliminate agricultural non-point source loadings of nutrients and pesticides to both ground and surface waters. A significant element of this demonstration address animal waste managment systems.

Texas.—This demonstration is located in the Seco Creek watershed in Bandera, Median and Uvalde counties. The project will demonstrate best management practices to reduce non-point sources of ground and surface water contamination from range and cropland. Practices will focus on methods to reduce loadings from pesticides, nutrients and animal wastes.

Wisconsin.—The demonstration project is situated in the watershed of the East River, primarily Brown County. It will emphasize agricultural production practices that decrease and/or eliminate the non-point source loadings to ground and surface waters from nutrients (including animal wastes) and pesticides.

Mr. WHITTEN. Would you please describe the eight additional projects you plan to start in fiscal year 1991?

Dr. JOHNSRUD. We are currently preparing the guidelines for the States to nominate potential sites for 1991. The demonstration projects are a cooperative, coordinated multi-agency effort. In 1990, the Extension Service and the Soil Conservation Service provided the primary leadership for project planning. This has been expanded in 1991 to include the Agricultural Stabilization and Conservation Service. We will continue to maintain close coordination with the Agricultural Research Service, the Cooperative State Research Service, the Economic Research Service, The Environmental Protection Agency, the Geological Survey, the National Oceanic and Atmospheric Administration and the respective State agencies with water quality responsibilities. The goal of the demonstration projects, to accelerate the transfer and adoption of current, new or innovative technologies to achieve area-wide reductions agricultural and agriculturally related non-point source contaminants to ground and surface water resources, will remain our primary priority.

NONPOINT SOURCE HYDROLOGIC UNITS

Mr. WHITTEN. During fiscal year 1990 you state that you will initiate 37 projects. Would you please list for the record the 37 projects?

[The information follows:]

State	Name of project
Alabama	Sand Mountain/Lake Guntersville
Arizona	Casa Grande/Coolidge
Arkansas	Moore's Creek
California	Westside San Joaquin Valley
Connecticut	Housantonic River
Delaware	Inland Bays Watershed
Florida	Middle Suwannee River Area
Illinois	Illinois River Sands
Iowa	Union Grove & Black Hawk
Indiana	Upper Tippacanoe
Louisiana	Bayou Queue De Tortue
Maine	Long/Cross Lakes
Massachusetts	Buzzards Bay
Michigan	Sycamore Creek
Minnesota	St. Peter/Prairie Du Chien
Mississippi	Tangipahoa River
Montana	Godfrey Creek
Nebraska	Elm Creek
New Hampshire	Great Bay
New Mexico	Dona Ana/Sierra
New York	East Sidney Lake
North Carolina	Goshen Swamp Watershed
North Dakota	Boman/Haley Watershed
Ohio	Indian Lake
Oklahoma	Battle Branch
Oregon	Ontario Area
Puerto Rico	Lake Loiza
Rhode Island	Pawcatuck
South Carolina	Camping Creek
South Dakota	Richmond Lake
Tennessee	N. Fork Creek & Fall Creek
Texas	Upper North Bosque
Utah	Little Bear River
Vermont	Lower Missisquoi
West Virginia	Greenbriar River
Wisconsin	Plover/Whiting Wellhead Area
Wyoming	Ocean Lake

ADDITIONAL NONPOINT SOURCE HYDROLOGIC UNITS

Mr. WHITTEN. During fiscal year 1991 you plan to initiate 37 additional projects. Would you also list those for the record?

Dr. JOHNSRUD. The 37 additional projects have not been selected. The guidance for submitting the proposals was jointly developed by the Agricultural Stabilization and Conservation Service, the Extension Service, and the Soil Conservation Service. Each state is invited to jointly develop and submit two proposals by mid-summer. These proposals will be evaluated by the USDA Education and Technical Assistance Committee who will recommend the selection of the 37 additional projects.

CHESAPEAKE BAY REGIONAL PROJECT

Mr. WHITTEN. Would you please describe the work that the Extension Service has underway in connection with the Chesapeake Bay regional project?

Dr. JOHNSRUD. The Cooperative Extension Service cooperates with other Federal and State agencies, universities, and organizations regarding this project in developing fact sheets and informational material to control nonpoint source pollution. More specifically, we have developed handbooks and material on animal waste management; provided exhibits for use at county, state, and regional conferences to promote nutrient management, pest management, and safe use of agricultural chemicals; provided technical assistance to farmers on nutrient and pest management; and provided technical assistance to farmers on the proper storage and safe use of agricultural and household chemicals to protect rural water supplies.

YOUTH AT RISK PROJECT

Mr. WHITTEN. You are requesting $10 million for the Youth at Risk project. Please indicate the amount the Extension Service requested for this project of the Department and the amount the Department requested of OMB.

Dr. JOHNSRUD. The Extension Service requested $10 million for this program from the Department, and the Department requested $10 million from OMB.

Mr. WHITTEN. How do you plan to distribute these funds to the States?

Dr. JOHNSRUD. Each State will be requested to notify all counties of the opportunity to apply for youth at risk funding. Funds will be distributed on a project proposal basis. States will identify up to three proposals for consideration. It is estimated that up to sixty programming sites will be funded in FY 1991.

FOOD SAFETY PROGRAM

Mr. WHITTEN. You are requesting an increase of $2 million for the food safety program. Would you please briefly describe for the Committee how you intend to use these funds?

Dr. JOHNSRUD. The food safety program proposed by the Cooperative Extension Service would address two critical issues. These are that consumer perceptions about the safety and quality of our food supply are not in agreement with the risks as determined by scientific risk assessments and even though our food system is one of the safest in the world, producers and processors can continue to impove food safety by the development of skills to use technology and systems that reduce relative risks.

Cooperative Extension education programs will be developed to address consumer perceptions by increasing: familiarity with the use of chemicals in the food supply; understanding of risk assessments and why experts disagree in risk estimates; awareness of current government surveillance and monitoring activities; and knowledge of the relative risks and benefits of specific food safety issues. In the process, consumers can become empowered to make better market choices and to recognize the role they play in the decision-making process.

Additionally, a portion of the increase would be used to expand and update the Food Animal Residue Avoidance Databank to include new information and data on additional chemcials that are potential residue violators; expand and update educational materials and programs on residue avoidance for use in all states; initiate development of methods of certification or verificiation for voluntary quality educational efforts with producers; and develop models and materials for nationwide educational program.

EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM [EFNEP]

Mr. WHITTEN. You again are proposing a significant reduction in funding for the EFNEP program. How many jobs would be eliminated if Federal funding for EFNEP were reduced by $36.6 million as you propose?

Dr. JOHNSRUD. Staffing for these programs is at the discretion of the State. It is difficult to estimate how many, if any, jobs would be eliminated. In making our funding proposal, we assumed States would provide matching funds for EFNEP as they already do for so many other Extension Service activities. On this basis, however, without States matching funds, it is possible that as many as 900 paraprofessional positions and 100 professional positions may be affected.

Mr. WHITTEN. What is the average pay that each of these individuals receives?

Dr. JOHNSRUD. The average paraprofessional salary is about $12–15,000, while the average professional salary is about $32,000–40,000.

Mr. WHITTEN. What percent of the total EFNEP funds are devoted to families on food stamps, the WIC program, or other Federal food assistance programs?

Dr. JOHNSRUD. Typically, over 60 percent of the EFNEP families are receiving food stamps, and over 40 percent participate in the WIC program. Nearly 70 percent have children enrolled in the National Child Nutrition Programs. A family may participate in more than one program at a time.

Mr. WHITTEN. For the record, how many individuals or families have received assistance under the EFNEP program each year for the last five years?

[The information follows:]

Year	*Number of participants*
1985	653,031
1986	553,327
1987	527,163
1988	556,918
1989	[1] 600,420

[1] Estimated

Mr. WHITTEN. You state that seven States received Federal funds for work on developing and testing cost-effective program-delivery models and six additional projects were made possible by funding from the private sector. Would you please describe these projects?

Dr. JOHNSRUD. During FY 1989, seven States—Illinois, Kansas Micronesia, Montana, New Jersey, Washington and West Virginia—received Federal funding for work on developing and testing cost-effective program delivery models with "preformed groups". "Preformed groups" were defined as individuals assembeled or gathered for another purpose who were referred to or recruited by Extension personnel for receiving the EFNEP curriculum. Each State made arrangements with three public or private agencies or groups to locate eligible clientele, and provide assistance in making meeting arrangements, providing transportation or child care or other services. EFNEP paraprofessionals then taught the EFNEP curriculum to these groups. This arrangement permits the paraprofessional's time to be devoted primarily to teaching and also expands the educational program to more individuals.

The cooperating agencies included: Food Stamp offices, WIC, Head Start, Young Families Program, a non-profit health clinic, Salvation Army, Community Action Agency, family shelters, a food pantry, Project Read literacy group and others. Typical audiences included: adolescent parents, pregnant teens, Indians on reservations, high school drop-outs, housing authority tenants and homeless families. It is anticipated that teaching preformed groups will be more cost-effective than recruiting and teaching individuals on a one-on-one basis. The results of these projects will be analyzed and effective models will be provided to States for replication.

We anticipate that these projects will demonstrate recruitment and interagency arrangement procedures, methods, a packaged curriculum, group delivery and individual assessment instruments to be used, and group curriculum delivery time frames. The expected results are: Increased EFNEP enrollment, improve cost-effectiveness and program models which can be replicated in other sites.

Additionally, six projects were made possible by funding from the private sector to support program delivery innovation. Kraft, Inc. donated six $2,000 grants to focus on developing and using electronic media in program delivery and marketing strategies for recruitment and program support in EFNEP.

Indiana's program focus is on nutrition education for pregnant women in response to that State's high infant mortality rate, and will feature training materials and videos as well as data collection instruments.

Nevada's grant provides interactive video instruction for EFNEP adults and pregnant teens. The project will result in increased nutrition knowledge for participants, with less staff time involved in teaching.

Ohio's program focus is on development of interactive computer sofeware curriculum to teach young people basic nutrition concepts. The software is designed for classroom use with a potential audience of 5,000 youth Statewide, with possible adaptation nationwide.

Giving potential donors an opportunity to support the State-wide EFNEP youth program is the focus of California's grant. Funding will be used to develop donor solicitation information tied to expanding EFNEP's outreach, especially in urban areas.

In Tennessee, Extension personnel are recruiting public housing residents to work with other residents and their children in nutrition education programs.

Wyoming is using their grant to develop a self-study guide to complement nutrition curriculum videotapes. The guide will be tested in a controlled study and when finished will be adaptable for national use.

ARCO Foundation funded four projects for 4-H EFNEP programs, in communities where their plants are located—Los Angeles, California; Seattle, Washington; Denver, Colorado; and Dallas, Texas. These funds help model new ideas for expanding the scope and outreach of the 4-H EFNEP program, particularly related to the issues of youth and family nutrition, diet and health, and economic well-being.

Both of these private sector contributions were made possible by the efforts of the National 4-H Council.

COMMITTEE ON REACHING OF LIMITED AUDIENCES

Mr. **Whitten**. You also state that in January 1990, a National Advisory Committee on Reaching Limited Resource Audiences was formed. Who are the members of this Committee?

Dr. **Johnsrud**. The committee on Reaching Limited Resource Audiences is comprised of representatives from throughout the Cooperative Extension System. We selected individuals from each region of the country from both 1890 and 1862 institutions, and from the various organizational levels, from the County agent to the State specialist and the State administration. We also provided representation from several subject disciplines i.e., the Expanded Food and Nutrition Education Program, Family Resource Management, 4-H and Human Development. The members will be provided for the record.

[The information follows:]

Cooperative Extension System—Committee For Reaching Limited Resource Audiences

MEMBERSHIP LIST—JANUARY 1990

Dr. Ruth Allen, Chair, Director—New York City Programs, Cornell Cooperative Extension.

Dr. Ruth Conone, Assistant Director and Associate Dean for Home Economics Extension, Ohio State University.

Ms. Marsha Goetting, Family Economics Extension Specialist, Montana State University.

Ms. Pat Hammershmidt, Extension Associate, 4-H Youth, Michigan State University.

Ms. June James, Immediate Past President, National Association of Extension Home Economists.

Ms. Karen Konzelman, EFNEP Coordinator, Purdue University.

Ms. Dianne Lennon, Extension Home Economist, EFNEP, Rutgers Cooperative Extension at Atlantic County.

Dr. Julia Marlowe, Family Economics Extension Specialist, University of Georgia.

Dr. Jacquelyn W. McCray, Assistant Administrator, Home Economics, University of Arkansas at Pine Bluff.

Ms. Linda Melcher, EFNEP Coordinator, University of Wyoming.

Ms. Louise Parker, Interim Family Economics Extension Specialist, Washington State University.

Ms. Ellen Schuster, EFNEP Coordinator, University of Minnesota.

Ms. Claudette Smith, Family Resource Managment Extension Specialist, North Carolina A&T State University.

Dr. Guillermina "Mina" Valdez, Home Economics Extension Specialist, Texas A&M University.

Ms. Linda Williams-Willis, Assistant Administrator, Home Economics Cooperative Extension, Prairie View A&M University.

Home Economics and Human Nutrition Representatives, Extension Service, U.S. Department of Agriculture

Dr. Nancy Saltford, Deputy Administrator.

Ms. Wells Willis, National Program Leader, EFNEP.

Dr. Jane Schuchardt, National Program Leader, Family Resource Management

Mr. WHITTEN. What is the annual cost of this Advisory committee and how is it funded?

Dr. JOHNSRUD. Its effort is supported by the institutions or organizations involved with the Committee.

PESTICIDE ASSESSMENT

Mr. WHITTEN. On page 9-21 of the notes you state that "About 20 staff years from the Cooperative Extension Sytem are required to complete 11 pesticide assessments." You plan to increase the number of assessment to 36. How many additional staff will be required to complete this and from where will they come?

Dr. JOHNSRUD. Currently about 20 staff years are being expended annually by the Cooperative Extension System in the pesticide assessment process which has generated an average of 11 reports per year. With the increase in funds for FY 90 and a streamlined action plan the Extension Service will generate data on pesticide usage which will be used in the assessment process. The data generation will allow Extension to continue its current personnel commitment yet undertake an increased number of reviews. If additional funds are made available for FY 91, the action plan calls for the process to be accelerated and a broader set of data acquired.

DISADVANTAGED FARMER ASSISTANCE

Mr. WHITTEN. You are proposing to terminate your program for assistance to disadvantaged farmers and you state that problems are not as severe today. Is that because of the fact that under the policies of the last ten years most of these farmers have now been forced out of business?

Dr. JOHNSRUD. The majority of the goals of the disadvantaged farmer assistance projects have been met. The farmers who needed this type of assistance have been served. The issues of agriculture profitability and farm financial management and decisionmaking are national initiatives within the Cooperative Extension System. Resources to continue to address these issues are available from other sources within the Extension system.

LOW-INPUT SUSTAINABLE AGRICULTURE (LISA)

Mr. **Whitten**. On page 9g-11 of the notes you say that during 1988 and 1989, 78 low-input sustainable agriculture projects have been funded.

Would you please list these 78 for the record?

Dr. **Johnsrud**. The publication LISA 88-89, January 1990, "Low-Input Agriculture Research and Education Projects Funded in 1988 and 1989," USDA Cooperative State Research Service provides a complete listing and summary of these projects.

[The information follows:]

The Northeast Region

Projects Funded in 1988 ....
- LNE88-1 Development of a Low-Input Apple Production System for the Northeast ....
- LNE88-2 Improving Farm Profitability by Efficiently Using the Pasture Resource
- LNE88-3 Role of Cereal Grain Cover Crops in Nitrogen Management for the Chesapeake Bay Region . ...
- LNE88-4 Accelerating the Adoption of Low Input Strateg- ies in Field Crops ......

Projects First Funded in 1988 Renewed in 1989 ....
- LNE88-5 Cover Crops For New England Vegetable Growers: On Farm Research, Economic Analysis and Outreach ....
- LNE88-6 Northeast Dairy Farm Forage Demonstration Project ....
- LNE88-7 Weed Control in Reduced Tillage Cropping Systems: Use of Overseeded Cover Crops ....
- LNE88-8 Implementation of Electronic Decision Support Technology for Apple Production ....
- LNE88-9 Alternative Cropping Systems for Low-input Agriculture in the Northeast ....
- LNE88-10 Development, Evaluation, and Implementation of Low Input Systems For Eastern Vineyards ....

Projects First Funded in 1989: ....
- LNC89-12 Ruminant Animal Production Using Tyfon Forage Brassica ....
- LNE89-13 Winter Cover Crops for Corn Production in the Northeast: N Balance and Soil Moisture Status ....
- LNE89-14 Northeast Organic and Sustainable Farmer Network: Manual of Current Practices, Extension Training and Field Days ....
- LNE89-15 Eggplant: A Model System for Implementing the Integration of a Biological Control Intensive Pest Management For the Major Insect and Disease Pests of Solonaceous Crops in the Northeast ....
- LNE89-16 Evaluation of Alternative Strategies for Small Fruit Production ....
- LNE89-17 Improving Milk Quality and Animal Health by Efficient Pasture Management ....
- LNE89-18 Marketability of Low-input Agricultural Produce ....
- LNE89-19 Reduced Tillage: Alternative Cropping System for Vegetable Production in the Northeast ....

The North Central Region

Projects Funded in 1988 ....
- LNC88-1 Integration of Conversation Tillage, Animal Manures, and Cultural Pest Control in Corn ....
- LNC88-2 An Economic Analysis of Producer and Industry Level Impacts of Low-Input Agriculture ....
- LNC88-3 Low-Input Ridge Tillage System for the Corn Belt ....
- LNC88-4 Sustainable/Low-Input Agriculture: An Overview Videotape ....
- LNC88-5 Low-Input Agriculture and Cover Crop Workshop for Extension and Research Personnel from Nebraska, Iowa, Kansas and Missouri . ...
- LNC88-6 Development of Organic Nitrogen Availability Functions for a Nitrogen Management Model ....
- LNC88-7 Low-Input Database and Information System ....
- LNC88-8 Sustainable Agriculture Educational Displays ....

Projects First Funded in 1988, renewed 1989: . ...
- LNC88-9 Agronomic and Economic Analyses of Alternative Small Grain/Row Crop Production Systems for the Northern Plains ....
- LNC88-10 Substituting Legumes for Fallow in U.S. Great Plains Wheat Production . ...
- LNC88-11 The Middle Border On-Farm Research Consortium . ...
- LNC88-12 Whole-Farm Economic and Nitrogen Budget Analysis on Low-Chemical and Conventional Wisconsin Farms ....
- LNC88-13 Evaluation of Integrated Low Input Crop- Livestock Production Systems ....
- LNC88-14 Beginning Farmer Sustainable Agriculture Project ....
- LNC88-15 An Integrated Research/Extension Program in Low-Input Crop Production for Ohio ....
- LNC88-16 Assessing Soil Phosphorus Availability in Low- Input Systems 65
- LNC88-17 Effect of Tillage and Weed Control Alternatives on Crop Rotations .
- LNC88-18 Making the Conversion from Conventional to Sustainable Agriculture: A Videotape Series for Farmers ....
- LNC88-19 Low-input Beef Cattle Systems of Production ....
- LNC88-20 Performance and Economics of a Low-input Feeder Swine Operation
- LNC88-21 Utilization of the Allelopathic Properties of Winter rye as a Method of Weed Control in Soybean Production . ...

Projects First Funded in 1989: ....
- LNC89-22 Development and Demonstration of Methods Toward Sustainable Apple Production ....
- LNC89-23 Lisa Impacts: Social, Economic, and Demographic Impacts of Low-Input Sustainable Agriculture Practices on Farms and Rural Communities in the Northwest ....
- LNC89-24 Crop Rotation, Legume Intercropping and Cultural Pest Control as Substitutes for Purchased Inputs in a Cash Grain Cropping System ....

LNC89-25 Synchrony and Contribution of Legume Nitrogen for Grain Production Under Different Tillage Systems ....

The Southern Region.

Projects Funded in 1988 ....
LS88-1 Low-Input and Organic Pest Management for Apples and Peaches Using Mating Disruption and Ground Cover Management ....
LS88-2 Whole-farm Low/Reduced Input Farming Systems and Educational Program ....
LS88-3 Planning Grant: Development of Low-Input Agricultural Technology Demonstrations at the Sunbelt Agricultural Exposition Demonstration Farm ....
LS88-4 Planning Grant: Development of a Farmer/Extension/Research Network and Farming Systems Data Bases for Low-Input Agriculture ....
LS88-5 Planning Grant: Sustainable Agriculture for and with Small Farms: Development of an 1890 Land Grant University Extension Demonstration Endeavor in NC, TN, and VA ....
LS88-6 Planning Grant: On-Farm Demonstration of Low- Input Farming ....

Projects First Funded in 1988, renewed 1989: ....
LS88-7 Low-input Reduced Tillage Crop Production Systems for the Southern United States ....
LS88-8 Development, Implementation and Evaluation of Low Input Crop and Livestock Systems for the Southern Region . ....
LS88-9 A Comparison of Cropping Systems Managed Conventionally or with Reduced Chemical Input ....
LS88-10 Solarization and Living Mulch to Optimize Low-input Production Systems for Small Fruits ....
LS88-11 Developing and Extending Minimum Input Strategies for Weed Control in Agronomic and Horticultural Crops ....

Projects First Funded in 1989: ....
LS89-12 Enhancing Farmer Adoption and Refining of a Low- input Intercropping Soybean-Wheat System ....
LS89-13 Substitution of Cultural Practices for Herbicides to Control Annual Ryegrass and Cheat in Small Grains ....
LS89-14 On-Farm Demonstrations and Research of Low- input Sustainable Farming ....
LS89-15 Enhancement of the Stability of Southern Region Agroecosystems Through Profitable Transition to Sustainable Agriculture ....
LS89-16 Development of a Low-input Multiple Cropping System for Small-Scale Farms ....
LS89-17 Communication and Information System for Low- input Sustainable Agriculture ....

LS89-18 Composting Poultry Litter - Economics and Market Potential of a Renewable Resource ....
LS89-19 Development of a Plan for Implementing a Low Input Sustainable Forage Production System in the Oklahoma-Arkansas Ozark Highland Region and Similar Land Areas ....

The Western Region

Projects Funded in 1988 ....
LW88-1 Evaluation and Design of Low Input Vegetable/- Small Grain and Small Fruit Systems of Western Oregon and Washington ....
LW88-2 Options for Reducing Production Inputs in the Cereal and Legume Growing Regions of the Northwest ....
LW88-3 Comparative Study of Established Low and High Input Vegetable Production Systems in California ....
LW88-4 Native Crops Research Project ....
LW88-5 Compiling a Database of Sustainable Producers for the Southern Rockies Region ....
LW88-6 Care and Feeding of the Soil: Introducing Legumes and Other Green Manures in Cropping Systems of the Northern Plains Rockies and Intermountain Region. ....
LW88-7 Planning Funds to Develop a Proposal to Study Low- Input and High-Input Taro Production ....
LW88-8 Planning Funds to Develop a Proposal on Low- Input Animal/Range Systems ....
LW88-9 Planning Funds to Foster the Development of a Consortium Network Information System Providing Gateway Linkage Between Users an Multiple Data Bases and Information Sources ....
LW88-10 Planning Funds to Support Development of a Proposal on Low-Input Rice Production in Northern California ....

Projects First Funded in 1989 ....
LW89-11 A Comparative Study of Low-input and High-input Taro Production in the American Pacific with Special Reference to Pest Control ....
LW89-12 Farmer-to-Farmer Technology Transfer Using Sustainable Cropping Systems Case Studies in the Dryland, Alternate Small Grains-Fallow Area of the Northern Rockies and High Plains ....
LW89-13 Application of Low-volume Water Systems to the Cultural and Biological Control of Root Diseases ....
LW89-14 Low-input Legume/Cereal Rotations for the Northern Great Plains-Intermountain Region ....
LW89-15 Total Resource Budgeting of Lisa Farm Enterprises ....
LW89-16 Bio-Priming for the Control of Pythium Preemergence Damping-Off in Vegetable Crops ....
LW89-17 Silvopastoral Alternatives for Fruit-Growers ....
LW89-18 A Comparison of Conventional, Low-input and Organic Farming Systems ....

LW89-19 A Conference on Maintaining the Nutrition and Health of Food-Producing Animals While Reducing the use of Inputs such as Growth Hormones, Antibiotics and Synthetic Wormers ....
LW89-20 Cover Crop Information for Researchers and Farmers ....
LW89-21 Information Delivery System for use in Implementation of LISA Research and Technology ....

ATTRA

Mr. WHITTEN. What funds were provided to ATTRA during fiscal year 1990 and how are these funds being used?

Dr. JOHNSRUD. Extension Service provided $115,000 from its base Federal Administration funds to the ATTRA project in FY 1990 These funds were used to keep the project operational during the first two months of the fiscal year when the Department was operating under a continuing resolution.

Mr. WHITTEN. What is the current status of the ATTRA project?

Dr. JOHNSRUD. The project was moved from the Extension Service to the Department of Interior and is operating under the Fish and Wildlife Service. We understand that funds were obtained from within Interior to continue the project for fiscal year 1990.

4-H PROGRAM

Mr. WHITTEN. What is the current situation with respect to 4-H enrollment? You might discuss the trends and the outlook.

Dr. JOHNSRUD. In 1989, 5,145,548 youth participated in 4-H youth programs—a 5 percent increase over 1988 enrollments. Largest increases were in 4-H special interest groups and in 4-H school enrichment programs, with some increase in 4-H club membership. There were more youth in 4-H from the 9-12 year age group and in older youth. Significant increases were reported in total 4-H project participation, particularly in natural resources; animals and poultry; economics, jobs and careers; citizenship and community involvement; health and safety; foods and nutrition; and individual and family resources.

There was a corresponding increase in the number of volunteer leaders assisting in 4-H youth programs—644,272 in 1989 which represented an increase of about 4,000 over the previous year.

Increases noted above have come about in spite of decreases in 4-H budgets in many States, resulting in less staff to do 4-H as well as the need for agents to serve in more than one county. Outlook for 4-H is for increased participation as a result of expended programs aimed at the major concerns of today's youth. At the same time, attention will also be given to strengthening traditional 4-H project offerings. With the current emphasis on volunteerism nationwide, we also look for continued expansion in the number of volunteers contributing to 4-H youth programs.

Mr. WHITTEN. Please provide for the record a five year table showing 4-H enrollment with separate figures for urban and rural.

Dr. JOHNSRUD. 4-H enrollments in 1989 continued to show a steady increase in youth participation from rural areas, with some increase in youth from urban areas. Currently, nearly 52 percent of the youth participants are from rural areas.

[The information follows:]

NATIONAL 4-H ENROLLMENT BY RESIDENCE

Year	Rural	Urban	Total
1985	2,328,120	2,009,338	4,337,458
1986	2,335,195	2,188,346	4,523,541
1987	2,339,895	2,426,429	4,766,324

NATIONAL 4-H ENROLLMENT BY RESIDENCE—Continued

Year	Rural	Urban	Total
1988	2,475,249	2,421,968	4,897,217
1989	2,680,584	2,464,964	5,145,548

Source: Annual 4-H Youth Development Enrollment Report, 1989 Fiscal Year.

FEDERAL ADMINISTRATION

SOURCE OF FUNDS

Mr. WHITTEN. Would you please provide for the record a table indicating, for fiscal years 1989 and 1990, the source of all funds for Federal Administration?

[The information follows:]

EXTENSION SERVICE SOURCES OF FEDERAL ADMINISTRATION

[Dollars in thousands]

Program	1989	1990	1991 [1]
Smith-Lever 3 b&c	$5,823	$5,850	$6,020
1890's and Tuskegee University	732	873	924
D.C. Extension	38	38	40
1890 Facilities	380	377	380
Federal Administration (direct)	9,083	8,745	5,697
Total	16,056	15,883	13,061

[1] Estimated.

OBJECT CLASSIFICATION TABLE

Mr. WHITTEN. Would you please also provide for the record and object classification table for Federal Administration that includes all funds received by this activity?

[The information follows:]

EXTENSION SERVICE OBJECT CLASSIFICATION

[Dollars in thousands]

Object class	1989	1990	1991 (estimate)
Personnel compensation:			
Salaries	$7,937	$8,102	$8,350
Benefits	1,188	1,210	1,244
Subtotal	9,125	9,312	9,594
Other object classes:			
Travel (21)	643	640	640
Transportation of things (22)	39	35	30
Communications, utilities and other rent (23.2)	698	680	630
Printing (24)	480	450	418
Other services	1,065	1,050	1,000
Supplies and materials (26)	210	200	150
Equipment (31)	142	140	100
Grants, subsidies and contributions (41)	3,654	3,376	499

EXTENSION SERVICE OBJECT CLASSIFICATION—Continued

[Dollars in thousands]

Object class	1989	1990	1991 (estimate)
Total	16,056	15,883	13,061

STAFFING LEVELS

Mr. **Whitten**. Would you please provide a five-year table for the record showing the total funding and number of people funded by the Federal Administration account?

[The information follows:]

FEDERAL ADMINISTRATION

	Funding level	FTE's
Fiscal year:		
1987	$12,257,000	174
1988	14,356,000	173
1989	16,056,000	171
1990	15,883,000	[1] 173
1991	13,061,000	[1] 175

[1] Estimate.

HOME ECONOMICS

Mr. **Whitten**. How much of the fiscal year 1990 Smith-Lever funds and how much of the Federal Administration funds will be devoted to the area of home economics?

[The information follows:]

Extension Service home economics costs, fiscal year 1990

	Million
Smith-Lever funds	$90.8
Federal Administration	1.5

IR-4

Mr. **Whitten**. Of the funds available to the Extension Service in fiscal year 1990, how much is available for the IR-4 program and what is the source of these funds?

Dr. **Johnsrud**. Extension Service does not have any funds available for the IR-4 program. These funds are available through other agencies at USDA.

Mr. **Whitten**. What is the Extension Service role in connection with the IR-4 program?

Dr. **Johnsrud**. Extension Service is represented on the IR-4 program USDA committee by a National Program Leader. The USDA committee is chaired by the representative from the Cooperative State Research Service. The Extension rule is to be aware of what is going on with IR-4 and to be supportive in acquiring needed data for the program.

D.C. EXTENSION PROGRAM

Mr. **Whitten**. Would you please describe for the Committee the Extension program as carried out in the District of Columbia?

Dr. **Johnsrud**. The D.C. Cooperative Extension is the only unit in the national system that conducts Extension programs strictly for the benefit of urban clientele groups. Programs are concentrated on the development of necessary skills to help inner city low-income and needy residents cope with daily life. Programs to be carried out at this level include proper management of limited resources, energy conservation, home repairs, human nutrition, family living, youth development, and environment and community improvements.

We will provide some examples of program efforts for the record.

[The information follows:]

Family and economic well-being.—Participants in the family program gained knowledge and skills in child development, talking to children about sex, human sexuality attitudes and behavior, discipline of children, coping with stress, and caretaking of the elderly, Newly arrived immigrants enrolled in family and individual support groups are helped in adjusting more easily into the American way of life.

Nutrition, Diet and Health.—This program stresses knowledge of basic nutritional facts, such as basic food groups, proper exercise and rest, management of stressful situations, cleanliness and disease prevention. Program participants increase knowledge of food selection, storage, preparation and preservation of foods; better nutrition and health measures for unwed mothers; teenage obesity; decreasing salt and fat in the diet; and the importance of fiber in the diet.

Building Human Capital.—Through Extension's 4-H program, youth increased their knowledge and awareness of career opportunities and were also provided information that helped expand their job-related experiences. New career options were explored by participating in educational career fairs and learning how to determine the best choice of schools for higher education. Leadership projects were conducted to provide coping skills and leadership experiences to help participants become better citizens in their comunities. Personal financial management workshops series were conducted. These included goal setting, value awareness, spending and savings plans, credit use and retirement planning. Learning buying skills and use of the U.S. financial system were taught to immigrants.

Water Quality.—A major concern is the amount of lead in drinking water and disposal of household wastes that may also find their way into the water. It is imperative that the community is educated regarding requirements to maintain clean water. Conducting training sessions, developing educational programs, conducting surveys, sampling of water, soil, and paint, and testing for lead are a few of the program's objectives.

Mr. **Whitten**. How many people are assigned to the Extension Service in the District of Columbia?

Dr. **Johnsrud**. The District of Columbia's Extension Service staff is made up of approximately 20 professionals, 20 paraprofessionals/aides, and 10 clerical/secretarial personnel.

Mr. **Whitten**. What is the contribution to the Extension Service from the District of Columbia?

Dr. **Johnsrud**. The District of Columbia is contributing $1.1 million to the Extension program in FY 1990.

Mr. **Whitten**. What are the other contributions the District of Columbia Extension Service receives?

Dr. **Johnsrud**. Presently, the District of Columbia Extension Service does not receive contributions from other sources.

EXTENSION APIARIST

Mr. **Whitten**. What is the current status of the position of an Extension Apiarist for which funds were included in the fiscal year 1990 Appropriations Bill?

Dr. **Johnsrud**. To comply with the wishes of the Committee, the Extension Service continues to fund the National Program Leader for Apiculture position in Wooster, Ohio. The main responsibilities of this positions continue to be to serve as a liaison with both the honey and bee industries and to coordinate numerous efforts associated with the Africanized Honey Bee.

HOME SEWING PROJECT

Mr. **Whitten**. Would you please bring the committee up to date as to your efforts in connection with the home sewing project?

Dr. **Johnsrud**. The Mississippi Home Sewing Project has been on going for several years, and the outputs from this successful program have been provided to other States through the Cooperative Extension System. The Agency has provided over $50,000.00 for this program, and is currently planning with Alabama and South Carolina to implement and expand the Mississippi model.

Mr. **Whitten**. Would you please describe the Mississippi project and what efforts you have made to expand the program to South Carolina and Alabama?

Dr. **Johnsrud**. The Mississippi project titled "Sewing As A Business" is a five day intensive workshop designed for clients who have, or are interested in, establishing a home-based sewing business. The workshop focus is on the development of entrepreneurial skills that will make the participants' business profitable and professional. The agenda includes business awarness, marketing directions, an update on trends, and the use of new technology.

Preliminary data, assembled by the Mississippi staff, indicated that 74 percent the graduates are sewing for profit; 94 percent who started a business after the workshop said knowledge gained influenced them to do so; 98 percent who were already in business said the workshop influenced them to make improvements in their businesses; and 52 percent have at least doubled their income from their sewing business.

The agency met with representatives from the Home Sewing Industry to plan for continuing the Mississippi project, and to discuss expanding the model to Alabama and South Carolina.

Mr. **Whitten**. Mrs. Smith.

Mrs. **Smith**. Thank you, Mr. Chairman.

Again, we're glad to have you join us, Mr. Johnsrud, and let me say that the Chairman is entirely right. This entire committee is very much dedicated to Extension Service.

4-H PROGRAM

My husband and I are products of Extension Service. You know, I started when I was a little girl and 4-H was one of the biggest things in my life.

I thought I was going to be the healthiest girl in Iowa until at the State Fair the doctors looked me over again and said you're too skinny. You see, your problems change with the years.

But we did all kinds of things in 4-H, and it was such a great learning experience. Then I married my husband at the end of our junior year in high school. As teenagers, we went out to western Nebraska.

You've heard about being poor as Job's turkey, we were poorer, because we had nothing. We were in debt to boot. But we learned from our county extension agent. Later, we got an award for being the best poultry producers in Nebraska.

We learned to be growers of certified seed potatoes. My neighbor and I started the first Extension homemaker club in my county, and it's still going.

What Extension Service has done for my family, it has done for millions of people. I'm a great supporter.

I'm delighted that you're involved in food safety, because you're the ones who carry the message to the people, and that message is so vitally important to carry.

YOUTH AT RISK

I'm delighted to tell you that Nebraska has a youth at risk program through the Extension Service, and it is working very, very well, and I go along with Mr. Whitten. I don't suppose any of those kids are involved in drugs, because they're involved in too many other good things.

FARM SAFETY

But now I have to pick on you about just one little thing. Why did you let the President's budget proposal eliminate all money for farm safety?

Now, I see just the other day, Mr. Johnsrud, where farming has gone ahead of mining as being the most hazardous occupation in the U.S. Last year we funded farm safety programs at nearly a million dollars. I think it's very important.

Don't you think it's highly important to educate individuals on lifesaving and safety practices on the farm?

Dr. **Johnsrud**. There's no question that farm safety is a public issue, and it is causing a lot of injuries and deaths. Nebraska is one of the States that's had a very successful farm safety program and had an impact on reducing injuries and deaths.

We applaud that in terms of what's been done, however when you get down to finalizing these budgets, resources just don't reach far enough.

That's where we have to set priorities. At the same time, we need to recognize that while those dollars are important, it's not totally what's going on in terms of farm safety across the country.

Mrs. **Smith**. Well, I recognize that, and don't feel too bad about doing it, because we'll probably put it back anyway and take out something else.

FOOD SAFETY PROGRAM

In reviewing your statement, I see that the Extension Service in the President's budget proposal would receive $2 million of the Administration's food safety initiative in the FY 1991.

Administrator Johnsrud, would you explain to the committee more fully how this money would be utilized? Why is it important for the Extension Service to be involved in the Administration's food safety initiative?

Dr. JOHNSRUD. Extension has a long history of providing education programs that promote the protection of the food supply. They currently have the networks and delivery mechanisms in place to deliver research-based information about new technologies and processes recommended to producers, processors, distributors, food handlers and consumers. By participating in the Administration's Food Safety Initiative, the Cooperative Extension System can make a valuable contribution to the implementation of that program.

YOUTH AT RISK

Mrs. SMITH. The President's budget includes a $10 million proposal to begin a new youth at risk program within the Extension Service. I understand that this is one of the highest priorities for Administration in the Extension Service budget.

I should add that the Nebraska Cooperative Extension Service already has a successful and beneficial youth at risk program. Would you briefly explain this program and its importance to rural America? What specific activities would this program be involved?

Dr. JOHNSRUD. The Extension Service's Youth at Risk Initiative focuses on prevention and intervention programs rather than treatment. Extension has identified eight critical educational needs for priority: building self-confidence and self-esteem; developing career and employment skills; fitness and health; reading and technological literacy; parental support; child care for school age children; problem solving/decision making skills; futuring to be able to see themselves in a future adult role.

In addition to programming with youth to foster their development, the Extension System will provide educational programs for parents that enable them to be more effective and supportive of their children. Extension is already positioned in local communities with its delivery network of staff and proven reputation. A successful youth at risk initiative must engage community leaders, agencies and organizations from the public and private sectors to work cooperatively in collaborations and partnerships.

This effort is important throughout America. Most data relating to substance abuse, teen pregnancy, school dropouts, suicide, child neglect and abuse, and poverty shows little difference between rural and urban communities. It is important in economic terms as well as social terms. Economically, our country cannot afford the current or increasing level of welfare and treatment programs, nor can we afford the loss in productivity which impacts nationally and internationally. The social importance is equally staggering. Everyday, growing numbers of youth are separated from the mainstream of American life as the consequences to society continue to rise. Children in poverty, suicide, illiteracy, child abuse, substance abuse, and teen pregnancy are the symptoms we must recognize and understand the real cause.

Extension can be a stronger system to provide programs in the area of after-school programs, substance abuse prevention, self-confidence, futuring, parenting, and health issues. Its program efforts enhance the development of youth, support the family unit, and empower local communities.

WATER QUALITY

Mrs. SMITH. The President's budget recommends a $15.5 million funding level in FY 1991 for water quality programs. I believe this is nearly a $10 million increase over your agency's FY 1990 funding level.

Would you explain to the committee the importance of this funding? What water quality activities is the Extension Service currently involved in and how would they be expanded?

Dr. JOHNSRUD. This proposed increase of $10 million is extremely important to the Cooperative Extension System role in carrying out the President's Initiative on Water Quality. As documented in the USDA's Water Quality Program Plan, these funds would be used to fully operationalize the projects begun in FY 1990—8 demonstration projects and 37 Non-point Source hydrologic unit areas; to initiate 8 demonstration projects and 37 Non-point Source additional projects, respectively, to increase the funds available to the States for specified projects to improve program support capabilities; to fund the CES component of the Midwest Initiative; and to increase our efforts in assembling appropriated water quality data bases.

In FY 1990, we allocated $900,000 for demonstration projects; $1,700,000 for non-point source hydrologic units; $1,750,000 for Improving Program Support Capabilities; and $100,000 each for the Data base Initiative and the Midwest Initiative.

In FY 1991, the allocations would be increased to $3.2 million; $5.1 million; $3.0 million; and $500,000 each, respectively. The increase requested is for the Cooperative Extension System to meet its obligations under the USDA's Water Quality Program Plan.

Mrs. SMITH. That was all, Mr. Chairman. Thank you very much.

AGRICULTURAL DEVELOPMENT IN THE PACIFIC

Mr. AKAKA [assuming chair]. For the past three fiscal years, this subcommittee has supported an initiative to promote agricultural development in the Pacific.

The thought of doing a truly effective job in the Pacific Territories is an intimidating task. These Territories include hundreds of islands spread out over millions of square miles.

However, we must proceed with this program, because for most of these islands, agriculture is the only means of income and the only way of assuring adequate nutrition for those folks there.

Do you feel that the agriculture development in the American Pacific is delivering agricultural know-how to these peoples in an effective manner, and what do you think is the best way to approach this problem?

Do you think that the program we have in place is the answer?

Dr. JOHNSRUD. Mr. Akaka, when I first came in this job four years ago there was a need to get over there and see what was happening with the Pacific Rim. I was not familiar with it.

Having now been there a couple of times, I will mention a few things. One is that I'm pleased at what I see, the kind of leadership and the kind of desire, to have strong Extension programs.

Second, and it really came home to me in stark fashion, the tremendous differences just in some of those islands way out in the Pacific, or between them and your home State. They have to deal with that tremendous distance and it's complicated by the fact that most of the other Pacific Rim islands have relatively small staffs. They need to link together and work together.

I developed an appreciation for that. I'm impressed by what I see in the leadership and the staff.

Mr. AKAKA. I can also tell you as an aside that I know you would represent great knowledge and technical abilities about agriculture.

When I was out there for the first time quite a few years ago, one of the people in that island handed me a coconut, and when I looked at all of them, they were all drinking from that nut.

I looked around for a screwdriver, I looked around for a hammer, and I couldn't find any of that, and finally I turned to him, and I said, how do I drink this, and he got another nut and he jammed it into the one that I had, and there was a nice round hole.

So at that moment, I felt my ignorance. Only to tell you that the culture that they have there and the knowledge they have of the culture and also of the agriculture that they have there is enormous, and sometimes we have to learn from them.

URBAN GARDENING

But they have a lot to learn from us and from your Extension Service. Sometimes people don't think that in Hawaii we are considered urban, but for many years I listened attentively to our Chairman Whitten as he spoke of the virtues of the Urban Gardening Program.

Now that Hawaii has become part of this program, I am a true believer of urban gardening. According to your Department, for each dollar invested in the Urban Gardening Program, $5.50 generates in fresh produce for participating homeowners.

Do you agree that Hawaii, because of its good climate, is particularly well suited to the Urban Gardening Program?

Dr. JOHNSRUD. FY 1989 was the first year that there was funding in the budget for an urban gardening program in your State. I believe it was about $100,000.

At that time, I believe I testified that one of the advantages that you had there was that you could garden year round, which is not true in some other places. This advantage makes Hawaii very well suited for an urban based gardening program.

URBAN GARDENING

Mr. AKAKA. Approximately how many Honolulu residents contacted Extension personnel to obtain information on gardening during the last year for which statistics are available?

Dr. JOHNSRUD. In FY 89, Hawaii has reported that home gardening consultations through telephone contacts, demonstrations and lectures on gardening totaled about 14,877. Additionally, a television program "Diggin' In" was run on Hawaii public TV and had an audience of 12,000. Master Gardeners trained by Extension provided assistance to 5,734 additional people. Extension also trained 21 garden center personnel so they could assist their customers with correct information. Hawaii estimates that garden center personel contact about 150,000 persons per year.

Mr. AKAKA. What are the benefits to Honolulu residents of participating in an urban gardening program?

Dr. JOHNSRUD. The urban gardening program in the 23 cities returns an average of $6 to the participant for each dollar invested by Extension. In effect, the benefits are greater than just the savings in food costs. Individuals and families obtain better nutrition and dietary habits by eating diverse types of vegetables and fruits either fresh or preserved. One other benefit is that of enhancing the community due to clean-up of areas and beautification as well as improving interpersonal relationships between neighbors or fellow gardeners.

Mr. AKAKA. What advantages does Honolulu have over urban gardening programs in other mainland cities?

Dr. JOHNSRUD. Honolulu, Hawaii is fortunate in that every day of the year is frost free. Therefore, crops such as vegetables can be grown throughout the year. Even though this is an advantage, there are some challenges as well. Pests also grow during the whole year and have to be managed properly and in concert with the environment.

AGRICULTURE DEVELOPMENT IN THE AMERICAN PACIFIC

Mr. AKAKA. What are the special challenges that the territories of the American Pacific face in the area of agriculture research and extension?

Dr. JOHNSRUD. There are many challenges facing our cooperative partners in the Pacific. One of the main ones is the tremendous distance between the various islands. This greatly inhibits the development and delivery of programs, as well as the marketing of agricultural products. Another problem is pests. While the region enjoys an advantage in the length and diversity of growing seasons, this also requires producers to address the problem of pests on a year around basis. This is very costly and difficult to manage. A third challenge is communications. Due to the distances and the less than modern communications facilities and utilities, establishing and maintaining an effective cooperative effort in research and extension between these island locations is difficult.

Mr. AKAKA. How can the American Pacific Initiative grant help the Pacific territories achieve their full agricultural potential?

Dr. JOHNSRUD. In the three years that the project has existed, it has allowed the partners in this region to get organized, develop plans, establish priorities and start addressing some of the challenges we have spoken about. The project allows additional goals to be achieved without drawing on the base funding provided for the ongoing programs. All of these goals are focused on achieving an effective and efficient agricultural system in the American Pacific.

Mr. Akaka. What funds were provided for this grant in FY 1990 and what amounts are contained in the budget request for FY 1991?

Dr. Johnsrud. In FY 1990, $645,000 was provided for this project. The FY 1991 Budget Request does not contain funds for this activity.

HUDSON RIVER FILM & VIDEO AGRICULTURAL FILM

Mr. Akaka. What is the status of the agriculture film being produced by the Hudson River Film and Video Company through a grant by the Extension Service?

Dr. Johnsrud. The Hudson River Film and Video Company has been working on these films for the past 2 years. They are now in the final phases of the first program focused on the present and future of American agriculture. They are planning to complete editing of this program in the spring of 1990. The second program, focused on the history of American agriculture, is currently in the planning stages and they expect to film in late spring and early summer with editing to be completed throughout the summer and fall.

Mr. Akaka. What agricultural states did the film crew visit and approximately how many days have been spent filming this project to date?

Dr. Johnsrud. Filming has occurred in New York, New Jersey, Pennsylvania, Ohio, West Virignia, Indiana, Illinois, Iowa, Nebraska, Wyoming, Arkansas, Mississippi, South Dakota, North Dakota, Minnesota, Wisconsin, California, Nevada, Arizona, and New Mexico. Fifty-five days of filming and 180 days of editing have been accomplished by the Hudson River Company.

Mr. Akaka. How can nonfarm or urban families benefit from viewing such a film?

Dr. Johnsrud. It is also hoped that nonfarm and urban families will be able to relate to the importance of agriculture and its effects on the U.S. economy and standard of living with additional understanding of the history of American agriculture.

YOUTH AT RISK

Mr. Akaka. What are the objectives of your proposed initiative, Youth at Risk?

Dr. Johnsrud. The goal of our initiative is to aid communities in addressing needs of youth at risk. The Cooperative Extension System will implement targeted prevention and intervention programs to improve the opportunities for youth and reduce the adverse conditions causing risk. Program objectives include: Form coalitions of private and public support in communities in support of youth; Increase self confidence and skills toward productive adulthood; Involve parents in building positive parenting skills; Reduce long-term costs to society by producing competent youth moving into adulthood; and Increase the employability of youth.

The three focus areas for this initiative include: School-age child care; Coalitions that support community programming in high risk youth programs; and Development of literacy and technological literacy in youth at risk.

Mr. **Akaka**. How would you characterize the problems of drug abuse among young people, especially those in rural areas?

Dr. **Johnsrud**. The National Institute on Drug Abuse of the U.S. Department of Health and Human Services, conducted a study titled "Illicit Drug Use, Smoking, and Drinking by America's High School Students, College Students, and Young Adults 1975–1987". That study reveals very little difference between large metropolitan, other metropolitan and non-metropolitan areas. The data for 1987 showed a total of 44% for large metropolitan high school seniors, 43% for other metropolitan seniors, and 38% for non-metropolitan seniors using any illicit drugs including tobacco and alcohol. There does not seem to be any data available to establish illicit drug use as a distinctively urban or a rural problem. The 6% difference is not as important as the data showing that between one-third to one-half of our Nation's youth are using illicit drugs at a dangerous level.

There are other related factors that indicate rural communities are not just sparsely populated versions of urban communities. The William T. Grant Foundation Commission on Work, Family and Citizenship produced a 1988 report titled "The Forgotton Half". This study reveals higher rates of poverty, scaled down aspirations of rural Applachian youth, lower life expectancy, higher infant mortality and a shortage of health care professionals in rural areas than in urban communities.

The Youth At Risk Initiative will not distinguish between rural and urban communities. The focus will be on communities with intense need and secure a comprehensive and collaborative approach with other agencies and organizations.

Mr. **Akaka**. To what extent do the problems of drug addiction in rural areas tend to be overshadowed by the more widely publicized problems of inner city drug addiction?

Dr. **Johnsrud**. It is difficult to say definitively. I believe you are correct, that most of the publicity regarding the plight of youth is focused on urban settings. However, the data available to us indicates the problems are not specific to a type of community. I see it as a problem that concerns all of us.

Mr. **Akaka**. To what extent do you believe that the Extension Service could give more attention to this problem?

Dr. **Johnsrud**. We see change taking place each day in our Extension System. We have excellent educational materials that are ready for implementation as more staff and volunteers are available and trained for delivery. The Extension System through identifying Youth At Risk as one of its national initiatives is saying that we want to be a leader in this effort. At the same time, Extension recognizes the need to work with other agencies and organizations in local communities to deliver the program. A single organization or program cannot do this job alone. The magnitude of the problem clearly indicates we can use more resources to increase our effectiveness.

YOUTH AT RISK FILM

Mr. **Akaka**. Characterize the theme and identify the goals of the Hudson River Film & Video proposal relating to youth at risk?

Dr. JOHNSRUD. We are not familiar with the goals of the proposal from the Hudson River Film Company in the area of Youth At Risk. However, I would like to emphasize that the Extension System has excellent educational materials in place to conduct the educational effort. Some of those materials already consist of videotapes and other state of the art educational aides. We have a current special needs project with the University of Arizona to produce a videotape of Youth At Risk model programs for use in staff training.

Mr. AKAKA. Mr. Traxler.

BUDGET CHARACTERIZATIONS

Mr. TRAXLER. Mr. Secretary, I am concerned by the characterizations of some Extension activities in the official USDA Budget Summary. Good programs like Youth at Risk and Water Quality as called "national interest" programs. Other worthwhile programs like farm safety and financial management are called "special interest". What makes one program "national" and the other "special"?

Dr. JOHNSRUD. The labels you mentioned were merely used to try to distinguish between proposals related to the national initiatives of the Cooperative Extension System, like water quality and food safety, and other programs that have appropriated funding for specific purposes.

FORMULA FUNDS

Mr. TRAXLER. You are requesting less than 2 percent increase in formula funds—not even enough to keep pace with inflation. I am hearing over and over that our ability to provide Extension services is eroding at a time when these activities could be more vital to the farmer's ability to sustain productive capabilities than at any other time. All of the research work done in the labs doesn't mean anything if we can't get it into the hands of the producer, and this is one of the primary missions of Extension—a mission which should not be changed.

My governor, Jim Blanchard, is telling me that his State support for Extension in Michigan has been going up by record amounts. But increases in State support is being diluted by the erosion of Federal support. This zero-sum gain is creating morale problems for Extension agents who never really know whether or not they will have a program to run. How can you in good faith recommend such a small increase in formula funds?

Dr. JOHNSRUD. First, I want to assure you that the mission of the Cooperative Extension System has not changed. Providing research based educational programs to the American public, whether producer or consumer, that address the vital concerns of our clientele will always be foremost. Second, Governor Blanchard's comments are correct and are true for virtually all the State Extension Services. In the past decade the Federal partner's share of resources has declined from 34% to an estimated 29%, while the State's portion has grown from 44% to 49%. However, I believe that for the most part, Extension agents and specialists are knowlegable about the problems of obtaining resources and continue to be positive about their programs and what they can contribute to the System and their clientele. Third, within the arena that the Federal partner operates in justifying and obtaining resources, we are very supportive of the Administration's proposal for the formula funds. As part of the domestic discretionary programs that are vulnerable within the Federal budget, the combination of new monies for targeted programs for national initiatives and the increases for formula funds over the last few years have reflected the commitment to keep the System focused and moving forward.

FORMULA FUNDS

Mr. **Traxler**. Please provide a table showing nominal and real dollar levels for Extension formula activities for the past ten years, including you budget request.

[The information follows:]

FORMULA FUNDS

	Appropriations	Constant dollars
1982	219,376	219,376
1983	230,376	220,034
1984	234,984	213,816
1985	241,484	210,169
1986	229,713	194,178
1987	236,213	191,731
1988	241,594	187,573
1989	241,594	178,959
1990	242,272	[1] 171,824
1991	[1] 246,535	[1] 167,711

[1] Estimate

Mr. **Traxler**. People in my State are more concerned than ever before about the ability to deal with infant mortality. Extension has been a great benefactor with the Expanded Food and Nutrition Education Program. Yet you are again proposing cutting the program by $37 million, and are expecting the States to match the remaining $21.6 million. Even if the match is made, the program has a net cut of $15 million. Where do you expect the difference to be made up?

Dr. **Johnsrud**. We share your concern about the high infant mortality rate in this country, and several States have taken steps to address this problem. In some States these programming efforts are closely associated with the EFNEP program, such as Alabama's Mastery of Motherhood program. This past year, Indiana developed and pilot tested a new program "Have a Healthy Baby". Other States, through their programming efforts for Youth at Risk, have addressed teenage pregnancy and parenting issues.

Although we will not be able to reach as many people as we would with past funding levels, we will continue the efforts which have been instituted to increase efficiency of the program. This includes the shift to cluster (2-3 persons) or small groups (5-10 persons) teaching in areas where population density, transportation and need permit; intensified teaching contracts to graduate participants after shorter enrollment periods; and maintaining and expanding referral and network systems for more efficient recruitment.

Mr. TRAXLER. How many States are prepared to make this match come October 1?

Dr. JOHNSRUD. We have not requested a commitment for matching funds from the States yet, and do not know how many are prepared. We do know that some States are experiencing cutbacks in their overall budget. While nutrition is an important national issue, it is difficult to know the final decision about the availability of resources for the proposed match.

Mr. TRAXLER. Many States have a great deal of dollars available due to infant formula rebates in the WIC program. EFNEP can help identify eligible persons who are not yet on this important feeding program. Why cut EFNEP at a time when these other resources are available and the need is so critical?

Dr. JOHNSRUD. The EFNEP program does expend resources on identifying individuals and families who may be eligible for various Federal food assistance and other public assistance programs. Many individuals are referred to these assistance programs, even when they may not be eligible for EFNEP. It is anticipated that the coordination and referrals between these programs will continue.

GROUNDWATER

Mr. TRAXLER. You are requesting $15.5 million for water quality initiatives in fiscal 1991. Could you fully describe how you are currently spending the dollars? Do they go to county offices or state offices with program specialists?

Dr. JOHNSRUD. We will provide for the record the guidance sent State Extension Directors on the Water Quality program. Additionally, the Secretary of Agriculture has announced the eight Demonstration Projects and the 37 Nonpoint Source Hydrologic Units; the CSRS is *now* finalizing plans about the Midwest Initiative—we are part of that process; my staff is now reviewing the state proposals for Improving Program Support Capabilities.

We transfer water quality funds to the state offices for their use in accordance to the priorities and programs contained in the USDA's Water Quality Program Plan. For FY 90, we fully expect the funds for Hydrologic Unit projects to be spent at some sub-state level; and the projects to Improve Program Support Capabilities are designed to increase the capacity of our county staffs to deliver water quality programs.

A copy of our guidance to the State Directors is attached—dated December 12, 1989.

[The information follows:]

United States Department of Agriculture
Extension Service
Office of the Administrator
Washington, DC 20250-0900

DEC 12 1989

SUBJECT: FY 1990 Water Quality Funds

TO: State Extension Directors

Congress has appropriated $5.25 million under Section 3(d) of the Smith-Lever Act to support Water Quality programs in the Cooperative Extension System. The Gramm-Rudman-Hollings reduction is $39,000. This funding emphasizes the importance of the National Initiative, which is a part of the USDA's Water Quality Program Plan.

As part of the USDA's Water Quality Program Plan, the initiative funding has some specific earmarks which are reflected in the following general distribution.

- Demonstration projects (8)	$ 900,000
- Non-point source hydrologic unit projects (37)	1,700,000
- Data base development, Midwest Initiative, and special projects	444,000
- Improving program support capabilities: nutrient management and pesticide management recommendations; SCS Field Office Technical Guides; pesticide education and staff training	1,750,000
- Program development projects and ES-USDA support programs	417,000

States participating in the demonstration projects are currently preparing project proposals.

Requests for proposals for the selected non-point source hydrologic unit projects have been transmitted; proposals are due on January 15, 1990.

Data base development is a supportive effort, with leadership from the Economic Research Service. No action is needed from the states at this time.

The Midwest Initiative is also a supportive effort, with joint leadership by CSRS and ARS. Research proposals will be requested soon from the relevant states, for areas in which 50 percent or more of the cropland is in corn or soybeans. These include all or parts of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska and South Dakota.

You should contact your research counterpart, and assign someone to represent Cooperative Extension on the research proposal development team. We will request specific Extension proposals from those states selected to participate in a research project. The Extension proposals should allow for development of viable educational programs to inform the general public of such research results and assist in accelerating former adaptation to maintain profitability while protecting water quality.

These special projects will be solicited at a later date, probably mid-February.

The $1,750,000 for improving program support capabilities presents opportunities for all states. There are three major topics to be addressed.

a. "Pesticide and nutrient management recommendations." This includes the kinds of information and programs that reduce the use of excess nitrogen on crops; the incorporation of integrated pest management strategies into crop production systems; credits for animal manures, crop residues and soil nitrogen; the use of quick nitrogen soil tests, where appropriate; the development of "Crop Management Associations" or similar mechanisms to help farmers manage agricultural chemicals more efficiently; the adjustment of recommendations by the Land Grant Universities and other advisory services; and the incorporation of such information into SCS Field Office Technical Guides.

b. "Staff training." The development and delivery of programs, materials and resource persons to field staff to assist them in understanding the dimensions of the water quality issue in their area, to make staff aware of programs and materials available to them for conducting educational programs, and to expedite the delivery of such programs to clientele groups.

c. "Pesticide education." The development and implementation of a strategy to strengthen state pesticide education programs, in consonance with identified state needs, and to establish and deliver programs that reduce or prevent the contamination of groundwater by agricultural and/or horticultural chemicals, especially pesticides, and which increase awareness of the need to immplement water supply protection strategies.

We encourage you to include the appropriate 1890 Institution or Tuskegee University as you develop a single coordinated proposal for your state which covers any or all of the major topics that you intend to address. The total must not exceed $35,000 requested from ES-USDA and must include a full match with state or county funds. The enclosed budget sheet and Form AD-1049, Certification Regarding Drug-Free Workplace Requirements, must be completed and submitted with your proposal.

The format for proposals is the same as that for plans of work for major programs. Please refer to the Cooperative Extension System Reporting Guidelines for specifics. We also encourage you to consult the publication, "How to Write a State Plan of Work for Water Quality," which has been distributed to your "Water Quality Contact."

These completed projects should: (1) provide information on the potential transport of pesticides and nutrients into our water resources; (2) enable Extension staff and other farm advisors to incorporate environmental considerations into their recommendation processes; (3) assist you in demonstrating responsiveness to State and Federal concerns about agriculture's impact on water quality; and, (4) be extremely helpful as we seek continuing support for water quality education programs.

Proposals (three hard copies of each) should be submitted to my office on or before January 26, 1990.

We expect to notify the recipients of selected proposals within 15 working days of receipt of the proposals. Funding will be handled through the quartely amendment to your Letter of Credit.

We look forward to a productive program year in water quality.

MYRON D. JOHNSRUD
Administrator

Enclosures

cc: Administrative Council

AO-138-P
(12/89)

Mr. TRAXLER. The National Association of State Universities and Land Grant Colleges has suggested that you should be given $15.5 million. What is your assessment of their recommendation? Are you proposing to spend money in the same fashion?

Dr. JOHNSRUD. Their recommendation is identical to that in the President's budget recommendation; we fully support both requests.

The funds would be distributed in a similar fashion. We propose to initiate eight more Demonstration Projects; 37 Nonpoint Source Hydrologic Unit Areas; to increase the state allocations for Improving Program Support Capabilities; and to increase the level of funding for the then-operational FY 90 Demonstration Projects and Hydrologic Unit Areas. We would also increase funding for operationalizing the Midwest Initiative.

Mr. TRAXLER. Could you update me on your cooperative efforts with EPA?

Dr. JOHNSRUD. We meet regularly with EPA to coordinate efforts and programs in Pesticide Applicator Training. We also meet with EPA, both separately as a USDA agency and as part of the USDA Water Quality Work Group, to discuss matters of both policy and programs. We have a liaison in a EPA Region office and are exploring similar arrangements in other EPA Regional and National offices.

NUTRITION STUDIES

Mr. TRAXLER. Could you also update me on your work with the Department of Health and Human Services regarding human nutrition information matters? We have talked about this matter in the past years.

Dr. JOHNSRUD. The involvement in the information of the year 2000 Health Objectives has continued to be fairly limited. We have reviewed the draft objectives.

We do expect to be involved in the implementation phase of the national effort to educate individuals as well as community leaders about the Health Objective, and to help make the necessary changes to achieve these objectives.

Mr. TRAXLER. I understand that some at HHS want to challenge the statutory role given to USDA in human nutrition matters. There may be overt challenges to this authority as part of the 1990 Farm Bill. What do you know of this situation? Who at HHS is the source of this dispute?

Dr. JOHNSRUD. We are not aware of the situation you describe and believe that the statutory authority granted to USDA is correct.

Mr. AKAKA. Mr. Watkins.

TECHNOLOGY TRANSFER PROJECT

Mr. WATKIN. Could you provide an update on the progress of the Mississippi/Oklahoma Technology Transfer Special Grant?

Dr. JOHNSRUD. The Technology Transfer project involves work at both Mississippi State and Oklahoma State Cooperative Extension.

[The information follows:]

At Mississippi State the program involves: Demonstration to local governments, Small Business and Industry Assistance, Information Management Through Networks, Computerized Crop Modeling Through Expert Systems, and Technology Utilization from Federal Laboratories.

The Technology transfer efforts at Oklahoma State are to:

1. Identify business and industrial classes with a significant decline in competitiveness due to:

(a) Influx of foreign competition.

(a) Raw material and process inputs of the industry becoming increasingly scarce and expensive (i.e., energy, labor, pollution control requirements).

2. Disseminate state-of-the-art reports to business, industry, entrepreneurial groups, and the financial community in Southeastern Oklahoma which represent the source of commercialization of one or more of the technologies identified. Assist individual businesses and industries to solve specific technical problems.

3. Identify organizations and associations that can assist in the commercialization/innovation process (Rural Enterprises and others).

4. Monitor private sector activity in Southeastern Oklahoma for commercialization or implementation of technologies identified thorugh the program.

RURAL ENTERPRISES

Mr. **Watkins**. What is the current status of the Oklahoma Rural Development Grant and please provide for the record the number of jobs that have been created either directly or indirectly as a result of this grant since the date of inception?

Dr. **Johnsrud**. Rural Enterprises works closely with the Cooperative Extension Service on the front end of the innovation processes. Extension works to identify priority concerns of Oklahoma businesses and local government in the technology field. These issues form the basis of targets of opportunities for Rural Enterprises technology searches, and for entrepreneurs in Oklahoma. Estimates of the number of jobs created through this program are not available.

RURAL DEVELOPMENT EXTENSION

Mr. **Watkins**. What study has been given by the Extension Service to the use of the system for additional hands-on applied rural development technology transfer?

Dr. **Johnsrud**. The Extension Service has studied and proposed a methodology which utilizes the basic entrepreneurial concepts that have made our capitalist system successful. The methodology is based on the identification of market needs in order to enhance the regularity with which innovative technologies are moved from the laboratory to commercialization.

Additionally, this approach is oriented toward new and small firms. While lacking the time and resources to search laboratories for technical innovation on their own, small firms are the primary sources of new job opportunities in this country.

Finally, the methodology is complemented by existing "business assistance" efforts available for university extension services, chambers of commerce, and others. The objectives of this approach are consistent with those of the Extension Service Revitalizing Rural America plan of work.

Mr. **Watkins**. Are any of the states looking at our functioning as business and industry/rural development Federal Extension Service in whole or part?

Dr. **Johnsrud**. Most State Cooperative Extension Services provide educational programming in business and industrial development and/or rural community development. These programs focus on such topics as retention and expansion of existing industry (Ohio), downtown revitalization strategies (Wisconsin), retail and service sector development (Iowa), industrial development (Kentucky), new business formation (Utah), community economic analysis (Wisconsin), economic impact assessment (Virginia), productivity improvement (New York/Cornell University), tourism development (Mississippi), value-added processing of raw materials (Mississippi), State rural development policy (Oklahoma), and international trade (Washington).

Mr. **Watkins**. Provided that funds are made available for rural technology transfer with relation to the Extension Service, would the agency work with Oklahoma on such a test effort?

Dr. **Johnsrud**. The Extension Service would be pleased to work with Oklahoma on innovative programs in rural development. Additionally, we have had excellent experiences with other parts of the country in the area of applied rural development through technology transfer.

Mr. **Watkins**. Is more of an applied Extension Service assistance to rural business and industry a means to providing a broader base of support for the agency given the shrinking agricultural production base?

Dr. **Johnsrud**. Today over sixty percent of farm income comes from off-farm sources and most farm families earn most of their income off the farm. Given these trends, which are likely to continue, Extension Service assistance to nonfarm business and industry actually helps people who live on farms. In addition, fewer than 500 rural counties today are dependent economically on agriculture. Their economic bases are much more diverse than in the past and are much more dependent on manufacturing and services than they are on either farming or extractive industries. Thus, to help rural people, Extension must reach out to the rural community as a whole with programs that help to generate jobs, income and public revenues. These include programs in community economic analysis, business and industry retention and expansion, small business development assistance, downtown revitalization, technology transfer, and economic impact assessment.

Mr. **Akaka**. Mr. Weber.

FEE HUNTING

Mr. **Weber**. Dr. Johnsrud, two years ago before this committee, I asked you to outline extension's policy on fee hunting? You then did so for the record, saying, quote: "We do have a statement that we use with our national leadership staff that we are not going to be in business of promoting" fee hunting.

It has just recently been brought to my attention that the Extension Service in Minnesota has proposed a plan to collect information about fee hunting and use it to establish a program aimed at expanding fee hunting businesses around the state. I am wondering Dr. Johnsrud if you could tell me what the Extension Services policy is on fee hunting? If it hasn't changed, I would ask that we sit down and talk with state people and the direction that they are heading.

Dr. Johnsrud. The Extension Service policy has not changed. We are not going to "promote" fee hunting per se. However, the proposal in Minnesota is in the embryonic stage and is focused on collecting data about fee based recreational businesses, of which fee hunting is one. Fee based businesses are a subject that has been brought to the Extension Service in Minnesota by its clientele in regards to its rural economic development concerns. These businesses may include, skiing, camping, hunting, sightseeing and other tourism activities.

As always, we at the Federal level and our state cooperators will be willing to work with you and your staff in regards to this matter.

YOUTH AT RISK

Mr. Weber. Dr. Johnsrud, I also want to briefly touch on the Youth at Risk program. In my district we have had a youth at risk pilot project which has been funded jointly through the Minnesota Extension Service and Southwest State University. It is my hope that we can try and beef up this project since it has been such a big success. I am wondering if you were aware of this project and would like to invite you to my district in order to get a first hand view of how well it is working.

Dr. Johnsrud. We are very aware of the program Helping Youth Create Their Future. It is a cooperative program with the University of Minnesota Extension Service, Southwest State University, the Minnesota 4-H Foundation and the Southwest Initiative Fund (McKnight Foundation dollars) and is active in 11 counties in southwest Minnesota.

The program in its first year has made a difference. I understand this project has gone well enough for the Minnesota Extension Service to look at replicating the project in the northwest section of the state and cooperate with North Dakota State University in offering the program.

I look forward to a site visit in the near future to see the program first hand.

Mr. Akaka. Well, I want to thank you very much for your service, the Extension Service. It has certainly helped this Nation, and I hope that our program will be as successful as yours is in other cities of our country.

I would also conclude by saying you should come out and visit the Pacific.

Dr. Johnsrud. Thank you. I always enjoy doing that.

Mr. Akaka. Thank you very much, Mr. Johnsrud.

Dr. Johnsrud. Thank you.

Mr. Akaka. If there are no other questions, thank you very much.

EXTENSION SERVICE

Statement of Dr. Myron D. Johnsrud, Administrator, Extension Service, before the House Subcommittee on Rural Development, Agriculture, and related agencies.

Mr. Chairman and members of the Committee, I appreciate the opportunity to discuss the FY 1991 Extension Service Budget Proposal. Mr. Chairman, as we enter a New Decade, the Cooperative Extension System is very optimistic with our "New Directions" for the coming years. The plan we have launched will continue to strengthen our commitment to programs that address top priority problems of the Nation. This commitment allows Extension to target our resources on programs designed to the health and competitiveness of the agricultural sector, rural economic development, environmental issues, food safety concerns and the risks facing our youth. Cooperative Extension is dedicated to improving the lives of the American people through educational programs. Programs that effectively utilize the latest scientific knowledge to address contemporary issues and problems.

The Cooperative Extension System is a future-oriented, self-renewing, national educational network that creatively delivers programs that are at the cutting edge of contemporary concerns and the needs of people as illustrated in the issues the System is addressing as it moves in these New Directions.

- Definite Agenda Setting. The National Initiatives have revitalized our system in recognition of the value of a specific agenda setting process through the involvement of the American public.

- Issued-Based Programming. Relevant National issues such as Water Quality, Youth At Risk, Food Safety, and Rural Revitalization are now priority throughout the Extension System.

- Partnerships and Teamwork. Interdisciplinary teams and strengthened partnerships with institutions of higher education outside the land-grant system, other Federal agencies, and the private sector are now being implemented and are instrumental in accomplishing the priority program agenda.

- Innovation and Risk-Taking. Throughout the System, Extension personnel are making bold decisions in designing and implementing needed programs that are targeting on sensitive societal concerns and issues.

- High Technology Utilization. The contemporary programs being developed throughout the Extension System are being supported by using the latest communication, information and technology delivery systems. These technologies are being recognized as cost cutting, efficient methods of targeting audiences and delivering the needed programs.

The National Initiatives effort, started three years ago, has provided a tremendous dividend for our cooperators in focusing resources and programs on critical National issues; it has signaled a renewed sense of relevance to these real world problems. Our Status of Programs portion of the Explanatory Notes outlines some of the concrete accomplishments resulting from National Initiatives. Please allow me to mention some notable accomplishments from these efforts:

In Mississippi, with the declining water table and fewer sources of irrigation water, the Extension Service is encouraging methods for more efficient use of both surface and groundwater for irrigation. Over 250,000 acres are being irrigated under these methods with savings of up to 30% of total water used.

Working with local governments, the University of Maryland Extension Service addressed water quality issues with over 21,000 Marylanders and made over 58,000 direct contacts with clientele. Water quality, and conservation were addressed in plans covering almost 400,000 acres statewide.

Over 1,300 Minnesota teenagers have been trained to teach elementary students about drug and alcohol abuse and decision-making skills. These teenagers are at work in over 40 communities and have reached an estimated 20,000 young students. Another program, managing stress and depression, has reached more than 100,000 junior and senior high school students through the efforts of some 2,000 youth professionals trained by the University of Minnesota Extension Service.

An Extension Service food safety task force at Louisiana State University quickly responded to food safety issues with a publication for the public on current food safety concerns on Alar and EBDC. Over 75,000 consumers adopted safe food handling practices as a result of these Extension programs.

Extension Service programs on pesticides are closely related to the efforts in Water Quality and Food Safety. In Arkansas, pesticide management and application was integrated with programs designed to prevent water degradation and reached over 2,000 producers and consumers and impacted on over a million acres.

These are just a few specific examples of programs repeated throughout the Nation by the Extension Service. Programs that are targeted on current and longer term critical National and State issues. Our budget proposal for FY 1991 emphasizes the issues the System determined as high priority, based on public input to our program agenda.

PROPOSED FY 1991 BUDGET

The Budget Proposal for FY 1991 for Extension Service totals $345,676,000.

The proposed overall funding levels and specific budget items are reflective of the Administration's priority issues and the increased role of the Cooperative Extension System in addressing some of these major National issues.

While the President's Budget contains traditional proposals of reducing or eliminating certain earmarked funding, the FY 1991 increases provide the Extension Services with resources that can be directed to the following program priorities:

-- bolster efforts in addressing Water Quality, Youth At Risk, Food Safety and Environmental issues;
-- maintain support for Core programs carried out with the Smith-Lever Formula 3(b)&(c) Funds;
-- further enhance the capacity of the 1890 Institutions and Tuskegee University in conducting their special missions

An increase of $4,263,000 is being proposed for the Smith-Lever 3(b)&(c) formula funds. Basic general formula funding has been fairly constant for several years. Strong Federal support for these funds allows the System to sustain the basic specialist staff involved in support of National and State priorities in an effectively and timely manner. These funds, matched by the States on a one-to-one basis, provide for support of core programs in all institutions.

$15.5 Million is proposed for water quality programs in FY 1991. This proposal is Extension's part in the coordinated government initiative. The initiative spoken about by Secretary Yeutter involves several USDA agencies, EPA, the U.S. Geological Survey and our partners in the Land-Grant Institutions. The funds will support educational programs to America's farmers that address the voluntary adoption of improved environmentally - sound management practices which do not sacrifice profitability and continue the enhancement and maintenance of water quality. Demonstration projects, improved program support capabilities with SCS, Non-point Source Hydrologic Unit projects, and Regional efforts are the key elements of this proposal.

President Bush in his State of the Union message mentioned two very critical issues that must be faced by America today - Education and Building Human Capital. And nowhere is this more critical than in the area of our Nation's Youth. The $10 million program proposed for Youth-at-Risk by Extension is our part of that challenge. The primary objective of this program is to implement prevention and intervention programs to assist youth in dealing with the adverse conditions causing risk such as drugs, poverty, lack of positive parent support and negative peer pressure. The Extension Service has a proven history of educating young people and offers the advantage of providing stable, university based support. By enlisting the support of local communities, independent volunteers and the private sector, we hope to maximize efforts of all these groups in positively impacting youth and families.

The Cooperative Extension System will implement programs modeled after existing successful projects which are operating in several States. This funding will provide support services and training targeted to existing or start-up projects operated by other organizations or local communities addressing the youth-at-risk issues. Specific commitments for matching at the local level will be required. The importance of this proposal, which deals with our Nation's future generations, cannot be overemphasized. We believe our expertise and experience in this area, can contribute greatly in addressing this major societal problem.

We are requesting $2,000,000 to strengthen our Food Safety program. The Extension Service is the only nationwide educational network that links research, science and technology to the needs of the people. Currently, the Cooperative Extension System is engaged in a variety of educational programs for all sectors of the food chain -- producers, handlers, consumers. We want to expand our educational program on understanding risk assessments of food safety issues. This funding will allow a more focused effort on a coordinated nationwide program to address food safety issues which often cause undue concern among consumers and producers because of lack of understanding.

Consistent with USDA's commitment to strengthen the 1890 Colleges and Tuskegee University, our FY 1991 Budget proposes a $1,256,000 increase to enhance the Extension effort at these Institutions to address major national concerns such as teenage pregnancy, drug abuse and the aging population. The 1890's have a crucial role in identifying and targeting critical issues which can be addressed through their relationships with limited resource groups.

A $1 million increase is requested for the Pesticide Impact Assessment program. As an expanding effort in addressing the priority environmental concerns of the Nation, this increase will support the Cooperative Extension System's responsibility for pesticide assessments which respond to Federal regulatory issues on specific pesticides. The evaluation of pest control and measures in endangered species habitat, and the study of new pesticides and pesticide alternative will be accomplished. Additionally, funds would be used to maintain a National database of pesticide usage. A database that may be linked with others to assess the impacts of water quality management activities at National and State levels.

A $500,000 proposal is included in the Federal Administration line item for Extension Service-USDA. These resources are critical for ES-USDA to remain an effective and efficient partner within the Cooperative Extension System. The requested funding level is vital for handling the substantial responsibilities required of ES-USDA as both a coordinator and working partner with other Federal, state and local agencies and organizations in behalf of the Cooperative Extension System..

An intensified EFNEP program is proposed in FY 1991. The proposed funding level is based on more cooperation with the Food Stamp program, WIC and other USDA efforts, training more volunteers for program delivery, and blending the historic one-to-one relationships of EFNEP aides and clientele increased use of small-group involvement by participants. We also propose matching at the State level.

Lastly, we are proposing the elimination of the earmarked funding for Urban Gardening; Farm Safety; Farm Financial Management; RREA; Disadvantaged Farmer Assistance Grants; Rural Development Centers and certain special projects under the Federal Administration account. Most of these projects have been sufficiently integrated into ongoing programs.

This concludes my remarks Mr. Chairman, I will be happy to respond to any questions from you and other members of the Subcommittee.

EXTENSION SERVICE

Purpose Statement

Cooperative extension work was established by the Smith-Lever Act of May 8, 1914, as amended. Legislation authorizes the Department of Agriculture to provide, through the land-grant colleges, cooperative extension work that consists of the development of practical applications of research knowledge and the giving of instruction and practical demonstrations of existing or improved practices of technologies in agriculture, uses of solar energy with respect to agriculture, home economics, related subjects and to encourage the application of such information by demonstrations, publications, and other means to persons not attending or resident in the colleges. This work is further emphasized in Title XIV (National Agricultural Research, Extension, and Teaching Policy) of the Food and Agriculture Act of 1977, as amended in 1981 and 1985.

To fulfill the requirements of the Smith-Lever Act, state and county Extension offices in each State, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, the Northern Marianas and Micronesia, conduct educational programs to improve American agriculture and strengthen the Nation's families and communities.

The Extension Service, USDA, provides national leadership and represents the U.S. Department of Agriculture within the Cooperative Extension System, comprised of some 21,000 state and local Extension system employees and 2.9 million program service volunteers. As of September 30, 1989, there were 163 full-time permanent employees and 12 other than full-time permanent employees, all located in the D.C. metropolitan area.

EXTENSION SERVICE

Available Funds and Staff-Years

1989 Actual and Estimated, 1990 and 1991

Item	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff Years
Extension Service	$361,370,000	171	$369,180,000	173	$345,676,000	175
Obligations under Other USDA Appropriations:						
Agricultural Stabilization and Conservation Service -						
Colorado River Salinity	273,000		546,000		546,000	
Rural Clean Water Project	481,019		420,000		420,000	
Marketing Pilot Program	12,500					
Agricultural Research Service -						
Food Supply Safety	37,569		--		--	
Support Services	4,566		5,000		5,000	
Rural Technology Study	50,000		50,000		50,000	
Study on Income Opportunities	25,000		25,000		25,000	
Regionalize Teaching/Research Prog.	25,000		25,000		25,000	
Water Quality Evaluation	40,500		41,000		41,000	
Marketing Pilot Program	12,500		13,000		13,000	
Information Management	75,000		75,000		75,000	
Gossym/Comax Info. Unit	50,000		50,000		50,000	
Cooperative State Research Service -						
Low-Input Farming	100,000		--		--	
Shared Positions	34,500		35,000		35,000	
Video Teleconf.-Biotechnology	12,000		--		--	
National Study Brochure	1,200		--		--	
Low-Input Farming Brochure	3,475		--		--	
Groundwater Quality Visit-IA	1,500		--		--	
Federal Crop Insurance Corporation - Educational Activities	350,000		375,000		375,000	
Food Safety and Inspection Service - Consumer Residue Education	2,500		3,000		3,000	
Soil Conservation Service - Water Quality	28,500		31,000		31,000	
Office of Advocacy & Enterprise - Small Farmers Conference	31,000		35,000		35,000	
Office of Budget & Program Analysis - Groundwater Quality Visit-IA	1,000		--		--	
Total, Other USDA Appropriations	1,652,329	--	1,729,000	--	1,729,000	--
Total, Agriculture Appropriations	363,022,329	171	370,909,000	173	347,405,000	175

Item	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Other Federal Funds:						
Reimbursements:						
AID-PASA International Extension	2,000,000		1,900,000		1,900,000	
Department of Energy -						
Low-Input Farming	48,500		—		—	
Department of Health & Human Services -						
Head Start	34,000		34,000		34,000	
Department of Interior -						
Fish & Wildlife Recognition Program	7,000		10,000		10,000	
Environmental Protection Agency -						
Water Quality Program	15,000		15,000		15,000	
Pesticide Applicator Training	1,824,519		1,862,000		1,862,000	
Underground Storage Tanks	15,000		—			
Wetlands Workshop - ND	7,000		—			
Emergency Planning Education	2,000		—			
Indian Nations Radon Training	5,000		—			
Department of Labor -						
RD Policy Education Program	35,000		—		—	
Economic Development Administration -						
Regional RD Policy	25,000		—		—	
U.S. Army -						
Family Life Enrichment	907,336		910,000		910,000	
Total, Other Federal Funds	4,925,355		4,731,000		4,731,000	
Non-Federal Funds:						
Federal Assistance Program Retrieval	4,886		5,000		5,000	
Federal Telecommunications System	184,355		85,000		85,000	
Cost Share Printing	144,639		145,000		150,000	
Total, Non-Federal Funds	333,880		235,000		240,000	
Total, Extension Service	$368,281,564	171	$375,875,000	173	$352,376,000	175

Item	1989 Actual	1990 Estimated	1991 Estimated
Full-Time Equivalent Staff-Years:			
Ceiling	171	173	175
Non-Ceiling	1	1	1
Total	172	174	176

EXTENSION SERVICE

Permanent Positions by Grade and Staff-Year Summary

1989 and Estimated 1990 and 1991

GRADE	1989	1990 est.	1991 est.
ES-5	1	1	1
ES-4	5	6	7
ES-3	1	1	---
ES-2	1	---	---
GS/GM-15	28	29	30
GS/GM-14	33	34	35
GS/GM-13	11	11	11
GS-12	5	5	5
GS-11	8	8	8
GS-10	1	1	1
GS-9	5	5	5
GS-8	6	6	6
GS-7	15	15	15
GS-6	19	19	19
GS-5	14	14	14
GS-4	11	11	11
GS-3	6	6	6
GS-2	1	1	1
Total, Permanent Positions	171	173	175
Staff Years:			
Ceiling..................	171	173	175
Non-ceiling.............	1	1	1
TOTAL....................	172	174	176

EXTENSION SERVICE

CLASSIFICATION BY OBJECTS

1989 and Estimated 1990 and 1991

	1989	1990	1991
Personnel Compensation:			
Headquarters........................	$7,936,907	$8,102,000	$8,350,000
Field..............................	- -	- -	- -
11 Total Personnel Compensation..................	7,936,907	8,102,000	8,350,000
12 Personnel Benefits..............	1,188,564	1,210,000	1,244,000
Total Pers. Comp. & Benefits.........................	9,125,471	9,312,000	9,594,000
Other Objects:			
21 Travel.........................	643,139	640,000	640,000
22 Transportation of things.......	39,296	35,000	30,000
23.2 Communications, utilities & other rent.......	697,522	680,000	630,000
24 Printing & reproduction.......	480,121	450,000	418,000
25 Other services................	1,264,805	1,250,000	1,200,000
26 Supplies & materials..........	210,492	200,000	150,000
31 Equipment	142,014	140,000	100,000
41 Grants, subsidies & contributions................	347,257,132	357,951,000	332,914,000
Total other objects...............	350,734,521	361,346,000	336,082,000
Total direct obligations...........	359,859,992	370,658,000	345,676,000
Position Data:			
Average Salary, ES positions.........................	$ 75,913	$77,963	$92,944
Average Salary, GM/GS positions.........................	$ 37,445	$38,456	$38,960
Average Grade, GM/GS positions.........................	9.99	9.99	9.99

EXTENSION SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Payments to States, Puerto Rico, Guam, the Virgin Islands,
Micronesia, Northern Marianas, and American Samoa: For payments for
cooperative agricultural extension work under the Smith-Lever Act, as
1 amended [by the Act of June 26, 1953, the Act of August 11, 1955, the Act
of October 5, 1962, (7 U.S.C. 341-349), section 506 of the Act of
June 23, 1972,] and the Act of September 29, 1977 (7 U.S.C. 341-349), as
amended, and section 1361(c) of the Act of October 3, 1980 (7 U.S.C.
301n.), to be distributed under sections 3(b) and 3(c) of said Act, for
retirement and employees' compensation costs for extension agents and for
costs of penalty mail for cooperative extension agents and State extension
directors, [$244,094,000;] $246,535,000; payments for the nutrition and
family education program for low-income areas under section 3(d) of the
Act, [$58,635,000; payments for the urban gardening program under
2 section 3(d) of the Act, $3,500,000] $21,600,000; payments for the pest
management program under section 3(d) of the Act, $7,164,000; [payments
for the farm safety program under section 3(d) of the Act, $970,000;]
payments for the pesticide impact assessment program under section 3(d) of
the Act, [$2,580,000;] $3,580,000; grants to upgrade 1890 land-grant
college extension facilities as authorized by section 1416 of Public
Law 99-198, $9,508,000, to remain available until expended; [payments for
an integrated reproductive management program under section 3(d) of the
Act, $47,000; payments for the rural development centers under section
3(d) of the Act, $950,000;] payments for extension work under section
209(c) of Public Law 93-471, [$953,000;] $1,000,000; payments for a
groundwater quality program under section 3(d) of the Act, [$5,250,000;
payments for a financial management assistance program under section 3(d)
of the Act $1,427,000; for special grants for financially stressed farmers
3 and dislocated farmers as authorized by Public Law 100-219, $3,350,000;
payments for carrying out the provisions of the Renewable Resources
Extension Act of 1978, $2,765,000;] $15,500,000; payments for youth at
4 risk programs under section 3(d) of the Act $10,000,000; payments for a
food safety program under section 3(d) of the Act $2,000,000; and payments
for extension work by the colleges receiving the benefits of the second
Morrill Act (7 U.S.C. 321-326, 328) and Tuskegee University, [$22,000,000]
5 $23,092,000; in all, [$363,146,000 of which not less than $79,400,000 is
for Home Economics:] $339,979,000; Provided, That funds hereby
appropriated pursuant to section 3(c) of the Act of June 26, 1953, and
section 506 of the Act of June 23, 1972, as amended, shall not be paid to
any State, Puerto Rico, Guam, or the Virgin Islands, Micronesia, Northern
Marianas and American Samoa prior to availability of an equal sum from
non-Federal sources for expenditure during the current fiscal year.

Federal administration and coordination: For administration of the
Smith-Lever Act, as amended by the Act of June 26, 1953, the Act of
August 11, 1955, the Act of October 5, 1962, section 506 of the Act of
June 23, 1972, section 209(d) of Public Law 93-471, and the Act of
September 29, 1977 (7 U.S.C. 341-349), as amended, and section 1361(c) of
the Act of October 3, 1980 (7 U.S.C. 301n.), and to coordinate and provide
program leadership for the extension work of the Department and
6 the several States and insular possessions, [$8,811,000; of which not less
than $2,300,000 is for Home Economics.] $5,697,000 (Rural Development,
Agriculture, and Related Agencies Appropriation Act, 1990.)

The first change is for the purpose of deleting language citing statutory authority that is redundant to preceding citations. This will allow the language in the Explanatory Notes to agree with the enacted appropriations language for the Extension Service.

The second change is for the purpose of deleting language providing for earmarked funding for Urban Gardening, Farm Safety, Farm Financial Management Assistance, Integrated Reproductive Management and Rural Development Centers. Earmarked funding for these programs is not proposed in fiscal year 1991.

The third change deletes language providing earmarked funding for Disadvantaged Farmer Assistance Grants under the Food Security Act of 1985 and programs funded under the Renewable Resources Extension Act. Earmarked funding for these programs is not proposed in fiscal year 1991.

The fourth change is for the purpose of adding language for funding Youth at Risk and Food Safety programs under section 3(d) of the Smith-Lever Act.

The fifth and sixth changes delete the requirement establishing a level of support for Extension's Home Economics program. This provision conflicts with the proposed reduction of the EFNEP funding as well as the primary intent of the Smith-Lever Act giving maximum flexibility to the State Cooperative Extension Services in determining programs' needing attention in the respective States.

EXTENSION SERVICE

Appropriation Act, 1990	$371,957,000
Budget Estimate, 1991	345,676,000
Decrease in Appropriation	-26,281,000

Adjustments in 1990		
Appropriations Act, 1990	$371,957,000	
Gramm-Rudman-Hollings Reduction (P.L. 99-177)	-2,777,000	
Adjusted Base for 1990		369,180,000
Budget Estimate, Current Law, 1991		345,676,000
Decrease from Adjusted 1990		-23,504,000

SUMMARY OF INCREASES AND DECREASES
(On basis of adjusted appropriation)

Item of Change	1990 Estimated	Pay Costs	Program Changes	1991 Estimated
Smith-Lever Sections 3b&c........	$242,272,000	- -	+$4,263,000	$246,535,000
Smith-Lever Section 3d:				
Food Safety....................	- -	- -	+2,000,000	2,000,000
Youth at Risk..................	- -	- -	+10,000,000	10,000,000
Water Quality..................	5,211,000	- -	+10,289,000	15,500,000
Food and Nutrition Education...	58,197,000	- -	-36,597,000	21,600,000
Pest Management................	7,110,000	- -	+54,000	7,164,000
Farm Safety....................	963,000	- -	-963,000	- -
Pesticide Impact Assessment....	2,561,000	- -	+1,019,000	3,580,000
Urban Gardening................	3,474,000	- -	-3,474,000	- -
Financial Management...........	1,416,000	- -	-1,416,000	- -
Rural Development Centers......	943,000	- -	-943,000	- -
Renewable Resource Extension Act.	2,744,000	- -	-2,744,000	- -
D.C. Extension..................	946,000	- -	+54,000	1,000,000
Disadvantaged Farmer Assistance Grants..............	3,325,000	- -	-3,325,000	- -
1890 Colleges and Tuskegee University...........	21,836,000	- -	+1,256,000	23,092,000
1890's Facilities................	9,437,000	- -	+71,000	9,508,000
Federal Administration and Coordination..............	8,745,000	+197,000	-3,245,000	5,697,000
Total, Available.................	369,180,000	+197,000	-23,701,000	345,676,000

PROJECT STATEMENT
(On basis of adjusted appropriation)

Project	1989 Actual Amount	1989 Actual Staff Years	1990 Estimated Amount	1990 Estimated Staff Years	Increase or Decrease	1991 Estimated Amount	1991 Estimated Staff Years
1. Payments to States:							
a. Smith-Lever Act							
(1) Sections 3b & c							
Program	$235,747,240	--	$236,422,120	--	+$4,092,480	$240,514,600	--
Set-aside for Federal Administration (4%)	5,822,760	—	5,849,880	--	+170,520	6,020,400	--
Subtotal, Sections 3b & c	241,570,000	--	242,272,000	--	+4,263,000(1)	246,535,000	—
(2) Section 3(d):							
Program:							
Food Safety	—	—	—	—	+2,000,000	2,000,000	
Youth at Risk	—	--	--	--	+10,000,000	10,000,000	--
Water Quality	1,500,000		5,211,000	—	+10,289,000	15,500,000	--
Food and Nutrition (EFNEP)	58,635,000	--	58,197,000	—	-36,597,000	21,600,000	--
Pest Management	7,164,000	—	7,110,000	—	+54,000	7,164,000	—
Farm Safety	970,000	--	963,000	--	-963,000	—	—
Pesticide Impact Assessment	1,633,000	—	2,561,000	—	+1,019,000	3,580,000	--
Urban Gardening	3,500,000	—	3,474,000	—	-3,474,000	—	—
Financial Mgmt	1,427,000	—	1,416,000	—	-1,416,000	—	--
Integrated Reproductive Mgmt	47,000	—	—	--	—	—	--
Rural Development Centers	950,000	--	943,000	--	-943,000	—	--
Subtotal, Section 3(d)	75,826,000	—	79,875,000	--	-20,031,000(2)	59,844,000	—
Total, payments under the Smith-Lever Act	317,396,000	144	322,147,000	146	-15,768,000	306,379,000	148

Project	1989 Actual Amount	1989 Actual Staff Years	1990 Estimated Amount	1990 Estimated Staff Years	Increase or Decrease	1991 Estimated Amount	1991 Estimated Staff Years
b. Payments under Renewable Resources Extension Act	2,765,000	—	2,744,000	—	-2,744,000(3)	—	—
c. Payments to the District of Columbia:							
Program	914,880	1	908,160	1	+51,840	960,000	1
Set-aside for Federal Administration (4%)	38,120	—	37,840	—	+2,160	40,000	—
Total, payments to the District of Columbia	953,000	1	946,000	1	+54,000(4)	1,000,000	1
d. Payments to 1890 Colleges and Tuskegee Univ:							
Program	17,559,360	1	20,962,560	1	+1,205,760	22,168,320	1
Set-aside for Federal Administration (4%)	731,640	—	873,440	—	+50,240	923,680	—
Total, payments to 1890 Colleges and Tuskegee University	18,291,000	1	21,836,000	1	+1,256,000(5)	23,092,000	1
e. 1890's Facilities	9,508,000	—	9,437,000	—	+71,000	9,508,000	—
f. Payments for Disadvantaged Farmers Ass't	3,350,000	—	3,325,000	—	-3,325,000(6)	—	—
2. Federal Administration and Coordination (Direct Appropriation)	9,074,992	25	8,745,000	25	-3,048,000(7)	5,697,000	25
Unobligated balance	32,008	—	—	—	—	—	—
Total available or estimated	361,370,000	171	369,180,000	173	-23,504,000	345,676,000	175
Reductions pursuant to P.L. 99-177	—		2,777,000				
Total, Appropriation	361,370,000		371,957,000				

Explanation of Program

Appropriations for the Extension Service enable the U.S. Department of Agriculture to perform its partnership role with State and local counterparts to carry out Cooperative Extension work for the benefit of our Nation's farmers and ranchers, and agricultural industries, rural and urban communities, families and youth, and the ultimate consumers of agricultural goods and services.

Cooperative Extension work is authorized under the Smith-Lever Act of 1914, as amended; the Rural Development Act of 1972, as amended; and the District of Columbia Public Postsecondary Education Reorganization Act. The National Agricultural Research, Extension and Teaching Policy Act Amendments of 1981 and 1985 (Title XIV of the Agriculture and Food Acts of 1981 and 1985) also authorize the Federal Government, States and counties to implement cooperative Extension programs commensurate with needs stemming from changes in U.S. agricultural practices and the world food and agricultural situation.

The Extension Service, an agency in USDA, is a legislated partner in the cooperative effort with each State, the District of Columbia, Puerto Rico, Guam, the Virgin Islands, American Samoa, the Northern Marianas, and Micronesia.

Extension work in States and counties is financed from Federal, State, county and local sources and is jointly planned with ES-USDA to provide educational programs adapted to national, state, and local problems and conditions. Extension helps people identify and solve their farm, home, and community problems through use of research findings of the U.S. Department of Agriculture and the State Land-Grant colleges and universities.

JUSTIFICATION OF INCREASE/DECREASE

(1) An increase of $4,263,000 for programs under section 3(b)&(c) of the Smith-Lever Act ($242,272,000 available in FY 1990).

Need for Change. The Smith-Lever formula funds provide for a network and resources of professional staff and volunteers, with integrated partnerships involving Federal/State/County governments, research, agribusiness, and the private sector. Through this unique nationwide network, key functions are performed in support of national interests.

o Provides nationwide leadership in adapting and transferring agricultural science and technology.

o Anticipates and responds educationally to critical national issues affecting the food and agricultural system.

o Mobilizes resources to respond to national disasters and catastrophes.

o Develops a cadre of volunteers prepared to serve the Nation, the state and the community.

Federal support for the Cooperative Extension System comes primarily from these sources of funds. Formula funds are more than matched by the states and county cooperators (currently $2.00 of non-Federal for each Federal dollar, on the average) and distributed on the basis of the rural and farm population of each state. The core of state and county extension programs are financed from these sources. Appropriate levels of formula funding provide for a consistent, stable, dependable, and reliable base of programming resources for all levels of the partnership to carryout common objectives. These funds also enable the Cooperative Extension System to sustain basic expertise in key scientific areas.

Equally important, USDA and the State Agricultural Experiment Stations depend upon the Extension System to help identify food and agricultural problems, to assist in the design and conduct of field experiments, and to help convert research results into practical and usable form. Demands for new technology to improve agricultural competitiveness, expand foreign markets as well as conserve a sufficient natural resource base for future needs, require a continued strong collaboration between research and extension.

Nature of Change. Basic formula funding has been constant for a number of years. Except for nominal increases required in implementing the new retirement system (FERS), Extension formula funds have not kept pace with inflation, in contrast to state funding. Strong Federal support allows the System to address National priorities effectively and timely. State Extension Services, especially those in geographically small or less densely populated states, are continuing to retrench program capacity.

(2) A net decrease of $20,031,000 for programs under Section 3(d) of the Smith-Lever Act ($79,875,000 available in FY 1990).

(a) An increase of $10,289,000 for Water Quality program under Section 3(d) of the Smith-Lever Act ($5,211,000 available in FY 1990).

Need for Change. To provide National leadership in the development and delivery of educational programs necessary to achieve the objectives of the President's Water Quality Initiative. These programs will:

o Transfer to farmers and ranchers the results of Federal and University research that enables them to better manage their use of agricultural chemicals.

o Address public and Congressional concerns about the impacts of agricultural chemicals in groundwater

- o Influence how farmers and landowners assess the benefits and risks of the use of agricultural chemicals
- o Increase awareness of the likely impacts of pesticides and nitrates on groundwater quality
- o Increase awareness of rural residents of their dependence upon groundwater, and their responsibilities to protect it from contamination.
- o Conduct education and information programs on improved management practices, that will provide farmers with appropriate technology to minimize water contamination.

The 1991 budget request would provide funds for Extension Service, USDA and the Cooperative Extension System to provide educational programs that encourage the voluntary adoption of management systems and practices that are economically viable and compatible with the maintenance or enhancement of water quality. Education and technical assistance are essential components of the Water Quality Initiative. The Initiative is a coordinated governmentwide program involving several USDA agencies, in cooperation with the Environmental Protection Agency, and the U.S. Geologic Survey. This budget request reflects the need for strong educational programs to support the President's Initiative.

Nature of Change. This budget allows the Extension System to fulfill its responsibilities with other federal and USDA agencies involved in the Water Quality Initiative. Demonstration projects; Non-Point Source Hydrologic Units Projects; and Regional Projects and Program Support Capabilities will be expanded to insure Extension System can accomplish its missions and responsibilities under the Water Quality Plan.

Demonstration Projects. These projects will be used to demonstrate how producers can quickly and effectively modify their farming practices to reduce agrichemical impacts on water quality on a multi-county or regional basis. This increase will allow the Extension System to expand from 8 to 16 such projects, in keeping with the five-year plan developed jointly with SCS and other action agencies. These projects will address high-priority problem areas, with focus on the voluntary adoption of practices that address specific water quality impacts from agriculture. ARS and CSRS will be involved in identifying specific mechanisms of agricultural impacts and the effects of these programs in enhancing water quality.

Non-point Source Hydrologic Units. These programs will address watershed management units having use-impairments primarily from agricultural non-point sources, as identified in State Non-point Source Assessment Reports (components of "319" plans), and will be conducted jointly with SCS, ASCS and the research agencies. This increase will allow the Extension System to expand its part of these programs from the initial 37 projects being initiated in FY90. Consistent with the budget proposals of other agencies, this funding level will also allow the Extension System to expand to an additional 37 projects. The Extension System will develop and conduct intensive, directed educational programs in each of the project areas.

Improved Program Support Capabilities. This component of the education and technical assistance plan will provide for the development of new agricultural practices to protect or enhance water quality; will assist in the preparation of appropriate technical materials; will support regional water quality program capabilities and resources; will assist in the training of an estimated 13,000 Federal and State agency personnel in the complexities of the interactions of land use, agrichemical use, and water quality; and in the subsequent delivery of such programs to agricultural audiences. These investments will increase the effectiveness of State and Federal personnel and of targeted water quality enhancement programs.

Regional Projects. This component would provide educational programs to large scale areas, that include the Chesapeake Bay, The Gulf of Mexico, the Great Lakes, the national Estuaries program, and EPA's programs in the protection of sole source aquifers and water-supply wellheads. Projects would be conducted jointly with USDA agencies and other Federal and State agencies, and would be targeted to creating awareness on a broad scale; and to catalyzing State and county programs in specific critical areas where agriculture is impacting water quality.

(b) An increase of $10,000,000 for Youth-at-Risk programs under Section 3(d) of the Smith-Lever Act (No funding available in FY 1990).

Need for Change. In the study "Youth The American Agenda", a report of the Cooperative Extension System, it was noted that youth are "at risk" from three primary situations: (1) Poverty, (2) Lack of Parenting, and (3) Negative Peer Pressure. Any one of the three conditions creates a risk for youth, but two or three working negatively and simultaneously creates a greater probability of losing a productive young person. An area of extreme concern is school dropouts. Young people are leaving school unable to read or function in the world of work. Other present-day societal problems include teen pregnancy, substance abuse, teen suicide, illiteracy and poor job skills.

The primary objective of this new program proposal is to implement targeted prevention and intervention programs to improve the opportunities for youth and reduce the adverse conditions causing risk. More specifically:

- Increase the employability of youth to enter and be productive in business and industry.
- Enlist the support of local communities, the private sector, and volunteers to form coalitions strengthening the local government commitments for youth.
- Increase the self confidence and skills of youth to cope with adverse conditions and become mature contributing adults.
- Reduce the long-term costs to society for medical, welfare and incarceration of individuals failing to reach productivity.
- Involve parents in educational programs which build their parenting skills.

The economic impact is staggering. The cost to society in terms of providing institutions, medical care, and welfare is immense. Illiteracy and lack of job and work skills prohibit many youth from entering the work force. If business and industry are also required to provide basic skills, then those costs will be passed on to the customer inhibiting the competitiveness of U.S. business and industry.

The Extension System's proven history of educating young people allows for considerable leveraging of additional funds and resources. The Extension System can enlist the support of local communities, the private sector, and the independent volunteer sector to form vital coalitions to maximize the efforts against the adverse conditions impacting on youth and families.

The Land-Grant Universities, partners in the Cooperative Extension System, are in a unique position to expand their outreach role and focus on youth development. Other supporting reasons for the Extension System to be successful in youth at risk programming include:

- a history of working in and with schools.
- a successful ongoing youth program reaching 4.8 million youth.
- experience in recruiting, training and managing volunteers.
- expertise in developing youth peer groups.
- experience in accessing the technical expertise of
- university faculty and the private sector.
- experience with coalition building to engage the resources of communities (public and private).

Nature of Change. Programs will be addressed through two major avenues. First, the Cooperative Extension System can provide programs modeled after existing successful projects which have been developed in various States. These programs are operated with professionals, paraprofessionals, and volunteers and provide direct educational services to clients. A second avenue is for Cooperative Extension to provide supporting service and training to existing or start-up projects operated by other entities. In both avenues, the Cooperative Extension System can offer educational services at a level appropriate to the needs of a particular client.

Cooperative Extension's university based expertise can improve management and leadership abilities, can assist in developing a cadre of skilled volunteers, and can enhance program content by offering research-based curricula in a variety of topics.

Under this proposal, the State Extension Services would identify specific communities or neighborhoods where needs are significant in terms of risk factors, poverty, high incidence of drug use, teen pregnancy, school dropouts, AIDS and homeless youth. These communities/neighborhoods would meet criteria for a comprehensive prevention/intervention project proposal for funding.

Community neighborhood size may range, up to 80,000 people. Multiple projects may exist in large cities. The target for this budget item is 30 to 40 communities with a commitment for multi-year support.

To assure maximum success of these projects, the following criteria will be required from the States:

- community based program delivery
- formation of a local coalition
- private sector support of time and fiscal resources from other agencies and organizations
- interdisciplinary support from the university
- local sources of funds -- including full matching with State or local government funds with an additional 50% match from private or non-profit organization funds

Examples of areas of emphasis include:

High Risk Youth - Extension's approach to most at risk youth will be through cooperative and coalition efforts with other agencies for training and program evaluation relating to crisis intervention.

A broad array of university resources will be used to create materials and strategies for training and for cooperation with other community agencies and organizations.

This support and training can lead to strengthening and expanding of program efforts. This approach is aimed at improving school performance, returning dropouts to a learning environment, and improving the overall situation of youth at risk.

School-Age Child Care: Extension would assist communities in the establishment of after-school child care programs where the need is critical. The Extension System has already initiated pilot program efforts with school-age child care. Its experience with youth development, experiential education curriculum, and a successful history of working with schools to complement programs gives Extension a unique role in providing programs that can be used to create dependable and high quality child care programs that are widely needed.

Funds are needed for "start-up" efforts to include training of private and public providers on topics of facilities, health, safety, nutrition, and youth development. Second, programs would be designed to be mostly self-supporting from user fees and state subsidies for low-income participants with fees established on the basis of ability to pay.

(c) An increase of $2,000,000 for Food Safety programs under Section 3(d) at the Smith-Lever Act (No funding available in FY 1990).

Need for Change. The Federal Government spends millions annually protecting our food. Surveys have shown that the American public feels that protection of our food system should be a major responsibility of the Federal Government, but that they ultimately make the food safety decisions that protect their health. This year's consumer response to Alar use on apples was a clear reflection of this as sales plummeted 30 percent. This action moved consideration of the safety of Alar out of the regulatory arena as producers responded by voluntarily discontinuing the use of Alar and demanding its removal.

Extension is the only nationwide educational network that links research, science and technology to the needs of people. Currently, the Cooperative Extension System is engaged in a variety of educational programs to provide all members of the food chain-producers, processors, handlers, and consumers—with the skills needed to protect the food supply. These existing programs can serve as the foundation for the additional programs required to maximize the safety and wholesomeness of the food supply.

Increased coordination could benefit producers by supplying a uniform and accessible knowledge-base to use for production programs. By a more focused effort, food safety problems, such as aflatoxin contamination, could be more effectively addressed. The Food and Animal Residue Avoidance Database (FARAD) will assist this effort by reducing the incidence of illegal residues in foods of animal origin through a directed educational effort at the farm level, and will insure the availability of useful research-based information on a broad range of possible volatile chemicals to producers, educators, service, regulatory, and research personnel as well as to consumers and the media.

Nature of Change. In order to address these critical food safety issues, programs will be developed to do the following:

- o Develop and implement model programs and projects that will achieve desired impacts described above among producers, consumers, the media and other members of the food chain. Federal funds to be matched by state and/or local resources.

- o Develop materials for a nationwide educational program on addressing the production environment and minimizing the presence of microbes, and foodborne disease (biosecurity) to increase the adoption, by producers, of a biosecurity program.

- o Provide proactive, educational programs on relevant, emerging food safety issues, such as pesticide use on produce for cosmetic purposes and aflatoxin contamination.

- o Coordinate, at the national level, interactions with FSIS, FDA, EPA, ERS and the private sector to design a framework for cooperation, identify priority issues, establish goals and coordinate a response.

- o Expand and update the FARAD to include new information and data on additional chemicals that are potential residue violators.

- o Expand and update educational materials and programs on residue avoidance for use in all states.

- o Initiate development of methods of certification or verification for voluntary quality assurance programs for at least two species of food animals and initiate educational efforts with producers.

(d) A decrease of $36,597,000 in payments to States for the Expanded Food and Nutrition Education Program (EFNEP) under Section 3(d) of the Smith-Lever Act ($58,197,000 available in FY 1990).

Need for Change. The target audience for EFNEP is eligible for, and is usually participating in, Federal food assistance programs and may also be receiving State and/or local public assistance as well. EFNEP is designed to work closely with Federal food assistance programs to increase their effectiveness, but there is a need to more closely involve State and local entities in various aspects of EFNEP, including funding. The basic program would concentrate on: (1) increased cooperation with food stamps, WIC and other Federal as well as State and local programs to identify families needing assistance; (2) providing in-depth training for volunteers from either public or private organizations that can serve as extenders of EFNEP food and nutrition education; and (3) extending effective methods that use fewer personal contacts for program delivery. The program would focus on the most critical food and nutrition needs of low income families, providing flexibility to incorporate non-traditional teaching methods that are especially effective helping low income families with young children.

Funding at this level would include a basic EFNEP youth component, which would specifically target low income youth with special needs. Food and nutrition principles would be taught in a setting which encourages an understanding of the relationship between food and fitness, and the vital role each plays in good health. The program would be closely allied with 4-H to involve youth in additional 4-H projects designed for youth development. It is anticipated that community support would further expand this EFNEP youth outreach and enhance the available resources to implement the core program.

Nature of Change. Seven States received Federal funding for work on developing and testing cost-effective program delivery models working in cooperation with other agencies and private groups, such as WIC, Head Start, health clinics, Salvation Army, Community Action agencies, family shelters, Project Read literacy group and others. The purpose of these projects was to develop increased cost effectiveness through recruiting pre-formed groups for EFNEP instruction and to test model programs which may be replicated in other States. Six additional projects were made possible by funding from the private sector to support program delivery innovation for the youth component.

In January 1990, a national advisory committee on reaching limited resource audiences was formed. Among its duties is a responsibility to consider ways of using EFNEP as a springboard for reaching hard-to-reach audiences with basic life skills necessary to address a wide range of needs. The intent is to more fully integrate EFNEP with other programs being developed, or already existing, which address the myriad needs of low income families.

The funding level requested allows the Extension Service to provide a nutrition education program to some of the recipients of Federal food assistance programs. At the proposed funding level, EFNEP would use the innovations outlined above to reach as many high risk families as possible.

Proposed FY 1991 funding levels for EFNEP are based on the premise that States will match the federal funding for this programs.

(e) An increase of $1,019,000 for the National Agricultural Pesticide Impact Assessment Program (NAPIAP) ($2,561,000) available in FY 1990).

Need for Change. The Pesticide Impact Assessment program provides management and coordination of USDA and State activity to promote informed regulatory decisions on registered pesticides that significantly benefit U.S Agriculture without causing unreasonable adverse effects on the environment.

These funds will provide support for the Cooperative Extension System's participation in the joint State-Federal National Agricultural Pesticide Impact Assessment Program (NAPIAP). Specifically, the increased funding requested will provide for meeting the following objectives:

- o Complete the development of a national database of pesticide usage by county and commodity.
- o Increase the capability of developing pesticide assessments annually from 11 in 1990 to 36 in 1992 and thereafter.
- o Evaluate new pesticides and pesticide alternatives.
- o Develop projects to evaluate pest control measures relating to endangered species habitat.

EPA is required under Section VI of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) to refer to the Secretary of Agriculture all proposed cancellation actions. The Secretary must be prepared to respond based upon the data that have been collected. Much of this information is derived through the Cooperative Extension System.

Recent developments regarding pesticides in groundwater, residues in food, endangered species, and the general acceleration of EPA's re-registration program are placing increased pressure on the agriculture system to provide the needed data. As a result of the re-registration activity EPA has plans to increase threefold the current number of chemicals in their special review program. This significant increase over recent years requires additional responses from the Cooperative Extension System.

The NAPIAP will be required to gather and analyze information on each of these chemicals. Data on pesticide usage and current research data will be needed to meet this increased requirement.

Currently, about 20 staff years from the Cooperative Extension System are required to complete 11 pesticide assessments. About 90 percent of the staff commitment is provided by State Extension staff. With the availability of pesticide use data and some augmentation to the USDA/Extension Service staff, up to 36 assessments can be completed. With this organization and output approximately 40 percent of the staff commitment would be provided by the States. This arrangement will allow closer coordination and timeliness of the assessments, as well as allowing State staff to conduct more applied research on the efficacy of new pesticides and pesticide alternatives.

Nature of Change. These funds will be utilized to support Extension participation on the assessment teams which will respond to Federal regulatory issues on specific or groups of pesticides. Without the requisite data, chemicals essential to agricultural production might be removed from the market place unnecessarily.

The requested increase for FY 1991 is to; complete the National database of pesticide usage; evaluate pest control measures in endangered species habitat; and evaluate new pesticides and pesticides alternatives.

(f) A decrease of $6,796,000 for the earmarked programs listed below ($6,796,000 available in FY 1990):

A decrease of $963,000 to eliminate earmarked funding for Farm Safety ($963,000 available in FY 1990).

A decrease of $3,474,000 to eliminate the Urban Gardening Program ($3,474,000 available in FY 1990).

A decrease of $1,416,000 to eliminate the special funding for assistance to farmers in Financial Management ($1,416,000 available in FY 1990).

A decrease of $943,000 to eliminate earmarked funding for the Rural Development Center ($943,000 available in FY 1990).

Need for Change. Programs in these specific areas have been developed with prior earmarked funds. Funding from basic formula programs, State and local governments and private sources could be used to continue high priority aspects of these programs.

Nature of Change. This proposal will eliminate specifically earmarked funding for certain low priority programs under Section 3(d) of the Smith-Lever Act.

(3) A decrease of $2,744,000 to eliminate earmarked funding for the Renewable Resources Extension Act (RREA) (P.L. 95-306) ($2,744,000 available in FY 1990).

Need for change. RREA funds have assisted State and local efforts to initiate and develop programs in forest and range conservation and utilization. These funds have stimulated additional State and local support for educational programs for small, private, non-industrial forest and range landowners. Funding from basic formula programs, State and local governments and private sources could be used to continue high priority aspects of these programs.

Nature of Change. This proposal will eliminate specifically earmarked funding for the Renewable Resources Extension Act.

(4) An increase of $54,000 for payments to D.C. Extension ($946,000 available in FY 1990).

Need for Change. The D.C. Cooperative Extension Service is the only unit in the national system that conducts Extension programs strictly for the benefit of urban clientele. Programs are concentrated on the development of necessary skills to help inner city low-income and needy residents cope with daily life. Programs to be carried out at this level include proper management of limited resources, energy conservation, home repairs, human nutrition, family living, youth development, and environment and community improvements.

The D.C. Extension program serves as a catalyst for cost-effectiveness in public assistance programs available to the low-income and needy residents of the Nation's Capital. It provides the educational component to make these programs more effective, with a view toward increasing self-sufficiency among recipients.

Nature of Change. Funding at this level would permit D.C. Extension to continue the programs in home horticulture, family resource and nutrition education community development, and youth development. Additionally, D.C. Extension will continue programs which assist inner city low-income and needy residents in improving their quality of life. Programs will continue in limited resource management, energy conservation, home improvements, human nutrition, family living, youth development and environment and community improvements.

(5) An increase of $1,256,000 for the 1890 Colleges and Tuskegee University ($21,836,000 available in FY 1990).

Need for Change. Through the 1890 institutions and the Tuskegee University, a major emphasis is given to the Department's efforts with small-scale and minority farmers. Programs of the 1890 land-grant universities and the U.S. Department of Agriculture are oriented and made available to hard-to-reach and predominantly limited resource clientele groups.

In coordination with the 1862 institutions, Extension programs at the 1890 institutions and Tuskegee University continue to help improve the quality of life of limited resource persons living in the 16 Southern border states. The primary mission of these institutions is to address the problems of a clientele group with limited resources in terms of adequate food, clothing and shelter.

Extension personnel at these institutions work with clientele to strengthen their ability to become contributing and productive citizens.

Several national problems existing today --- teenage pregnancy, school dropout by minority youth, underinvestment in human capital, family and economic stress, and poor nutrition, diet and health--can be addressed effectively by these institutions.

Nature of Change. There is an urgent need for increased funding to support Extension programs at 1890 land-grant institutions and Tuskegee University. As these institutions implement the national program initiatives in concert with 1862 counterparts, additional resources are required particularly in the following areas:

- Drug Abuse Program - Funding for this initiative is necessary to develop and implement programs to address a problem primarily affecting minority and low-income youth. There is a need to build strong family and community bonds for youth that will develop self esteem, promote pride and resist persistent school and community peer pressure.

- Teenage Pregnancy Program - Identify and develop effective educational programs to significantly reduce this problem affecting the total country.

- Aging Program - The number and proportion of people 65 and older is increasing faster than any other age group of the population. The unskilled minority elderly population is plagued with health, food shelter and other basic life problems which can be addressed by these institutions very effectively.

Through strong linkages with 1862 institutions and various external groups, both public and private, the 1890 institutions are playing a crucial role in identifying and targeting critical issues which can be more appropriately addressed through their unique relationships with limited resources groups.

(6) A decrease of $3,325,000 for payments to States for Disadvantaged Farmer Assistance ($3,325,000 available in FY 1990).

Need for Change. Disadvantaged Farmer Assistance grants were provided to the States of Nebraska, Iowa and Missouri. Additionally, funds were distributed in grants to Kansas, Mississippi, North Dakota, Oklahoma and Vermont to provide educational and counseling programs for economically distressed or displaced farmers. Initiated during the farm crises, these problems are not as severe today and major national initiatives to address issues of agricultural profitability and rural revitalization are proposed. Funding from basic formula programs, State and local governments and private sources could be used to continue high priority aspects of these programs.

Nature of Change. This proposal will eliminate specifically earmarked funding for this program.

(7) A net decrease of $3,048,000 for Federal Administration and Coordination (direct appropriation) ($8,745,000 available in FY 1990).

Project	1990	Inc/Dec	1991
Technology transfer	$ 330,000	-$330,000	—
Farm financial mgmt	189,000	-189,000	—
Rural Development	430,000	-430,000	—
Crambe & rapeseed	64,000	-64,000	—
American Pacific Init	645,000	-645,000	—
New England Vertebrate	94,000	-94,000	—
Rural Revitalization	137,000	-137,000	—
Rural Education Model	846,000	-846,000	—
Documentary films on American agriculture	174,000	-174,000	—
Crop Simulation Project	496,000	-496,000	--
Rural Rehabilitation Projects	256,000	-256,000	—
Presque Island	139,000	-139,000	—
Subtotal	3,800,000	-3,800,000	—
Base, federal administration	4,945,000	+555,000	$5,500,000
Annualization of pay raise	—	+197,000	197,000
Total	8,745,000	-3,048,000	5,697,000

(a) A decrease of $3,800,000 for special projects ($3,800,000 available in FY 1990).

Need for Change. Some of these projects have been funded for several years by the Congress. The results learned from them have been sufficiently integrated into ongoing programs and have generated additional resources from other than Federal funds to continue the expressed focus of the projects. Additionally, a number of these concerns are being addressed under other initiatives and funds within the budget request.

Nature of Change. This proposal will eliminate earmarked Federal funding support for these special projects.

(b) An increase of $555,000 for increased operating costs ($4,945,000 available in FY 1990).

Need for Change. The Federal administration and coordination of State Extension Services across the country and several territories is critical to program and policy development and implementation. Through the leadership of ES-USDA, the Department and the Federal Government have access to a grassroots nationwide system that is extremely efficient at responding to current and emerging priorities and crises at the local, regional and national levels. As the Federal partner in the national Cooperative Extension System located in 3,150 counties, ES-USDA serves an effective catalyst in mobilizing and coordinating timely and effective educational expertise and assistance. However, ES-USDA's leadership capacity is seriously threatened by a protracted decline in resources.

The Extension Service-USDA's ability to provide direction to the Cooperative Extension System in responding to national concerns and issues such as water quality, drought, economic crisis, youth at risk, agricultural and rural technology needs and economic development is being seriously eroded by significant decreases in "purchasing power" dollar funding. Additional resources are very critical in restoring and maintaining appropriate levels of expertise to effectively provide national leadership, direction, and support to the System.

Nature of Change. Requested funding level will allow more attention to be given to the substantial responsibilities required of the Extension Service, both as a coordinator and as working partner with other Federal, state and local agencies and organizations. ES-USDA needs adequate resources to access the expertise of Extension personnel throughout the land-grant universities.

Through the use of shared positions with the universities and other Federal agencies, and the establishment of centers focusing on various issues developed by the "best minds" within the Extension System, ES-USDA can perform its national leadership role more effectively. More specifically, the Extension Service must be able to participate actively in interagency working groups and other USDA and administration initiatives. As a minimum, the Extension Service must be in a position to acquire expertise to meet and work with its partners and counterparts at all levels on critical issues and programs, such as water quality, youth at risk, pesticides and chemicals, food safety and other priority national concerns.

With the development and implementation of the National Initiatives programming within the Extension System, there have been some rather significant adjustments in the responsibilities expected of ES-USDA and the manner of providing national program leadership to the states. The task of national program leadership and management has become increasingly intense. The "team" concept of bringing together the various strengths of both the Extension System and stakeholders to address a national priority or concerns is of extreme necessity.

c. An increase of $197,000 which represents 50% of the 1991 pay raise. The remaining 50% of the 1991 pay raise and the total 1990 pay raise are being absorbed. (No funding available in FY 1990).

Extension Service
Geographic Breakdown of Obligations
1989 and Estimated 1990 and 1991
(Amounts in 000's)

State/Territory	FY1989 Actual Obligations	Estimated Obligations	
		FY 1990	FY 1991
Alabama	$ 11,493	$ 11,768	$ 10,709
Alaska	1,191	1,172	1,018
Arizona	2,778	2,527	2,055
Arkansas	8,150	8,165	7,466
California	9,906	9,795	7,561
Colorado	3,552	3,326	2,859
Connecticut	2,345	2,313	1,945
Delaware	1,855	1,886	1,736
Florida	7,716	7,511	6,220
Georgia	11,326	11,358	10,024
Hawaii	2,241	2,150	1,238
Idaho	2,843	2,675	2,492
Illinois	10,866	10,760	9,258
Indiana	8,706	8,617	7,886
Iowa	10,001	9,467	8,395
Kansas	6,533	6,180	5,335
Kentucky	11,588	11,711	10,789
Louisiana	8,981	9,046	7,799
Maine	2,415	2,338	2,058
Maryland	5,269	5,266	4,657
Massachusetts	3,527	3,493	2,659
Michigan	9,582	9,447	8,335
Minnesota	9,398	8,636	8,040
Mississippi	10,491	10,522	8,895
Missouri	11,353	11,348	9,971
Montana	2,661	2,554	2,334
Nebraska	5,833	5,663	4,653
Nevada	1,272	1,233	1,090
New Hampshire	1,644	1,627	1,445
New Jersey	3,720	3,652	2,840
New Mexico	2,486	2,393	2,053
New York	11,534	10,977	8,498
North Carolina	15,456	15,562	14,241
North Dakota	4,826	4,697	3,124
Ohio	11,037	10,970	9,573
Oklahoma	8,002	7,937	6,811
Oregon	4,255	3,914	3,407
Pennsylvania	11,450	11,388	9,534
Rhode Island	1,237	1,211	990
South Carolina	8,614	8,568	7,710
South Dakota	3,388	3,374	3,130
Tennessee	12,013	11,888	10,713
Texas	18,302	18,472	16,047
Utah	1,984	1,889	1,661
Vermont	2,132	1,923	1,577
Virginia	10,689	10,527	9,593
Washington	4,584	4,401	3,854
West Virginia	4,614	4,536	3,933
Wisconsin	8,638	8,427	7,775
Wyoming	1,628	1,558	1,410
American Samoa	370	718	675
Guam	753	779	737
Micronesia	428	780	736
Northern Mariana Islands	458	698	656
Puerto Rico	7,467	7,410	6,533
Virgin Islands	744	761	720
District of Columbia	915	908	960
Sub-total	$347,240	$342,872	$298,413
To be allocated:			
Earmarked Efforts	—	9,050	30,582
FERS	—	4,000	4,000
Federal Administration	14,130	13,258	12,681

Table I
APPRORIATION FOR PAYMENTS TO STATES
STATE ALLOTMENTS, FY 1989 - 1991

Smith-Lever Act Section 3(b) & 3(c)	FY 1989	FY-1990	Proposed FY-1991
Alabama	$5,231,812	$5,244,834	$5,326,709
Alaska	751,085	754,061	772,771
American Samoa	641,034	643,477	658,837
Arizona	1,325,754	1,330,593	1,361,022
Arkansas	4,391,819	4,403,831	4,479,359
California	5,292,406	5,311,663	5,432,745
Colorado	2,080,741	2,088,183	2,134,974
Connecticut	1,567,538	1,573,019	1,607,481
Delaware	887,978	891,521	913,795
Florida	3,066,343	3,077,933	3,150,805
Georgia	5,820,150	5,836,835	5,941,747
Guam	675,325	677,932	694,323
Hawaii	953,304	956,394	975,821
Idaho	1,869,751	1,877,112	1,923,395
Illinois	6,957,331	6,982,259	7,138,997
Indiana	6,245,485	6,268,916	6,416,241
Iowa	6,625,561	6,651,022	6,811,110
Kansas	3,887,790	3,901,435	3,987,228
Kentucky	6,641,167	6,662,435	6,796,161
Louisiana	3,893,054	3,903,734	3,970,885
Maine	1,568,663	1,574,158	1,608,710
Maryland	2,383,356	2,391,302	2,441,760
Massachusetts	1,962,241	1,968,994	2,011,458
Michigan	6,339,179	6,361,272	6,500,186
Micronesia	692,347	695,173	712,941
Minnesota	6,216,814	6,239,419	6,381,552
Mississippi	5,447,039	5,458,945	5,533,803
Missouri	6,155,277	6,177,277	6,315,603
Montana	1,754,358	1,760,952	1,802,414
Nebraska	3,512,199	3,525,202	3,606,958
Nevada	758,166	761,248	780,628
New Hampshire	1,110,041	1,114,556	1,142,943
New Jersey	1,929,934	1,936,589	1,978,430
New Mexico	1,428,607	1,433,409	1,463,600
New York	5,980,962	6,000,506	6,123,391
North Carolina	8,793,146	8,817,230	8,968,660
North Dakota	2,437,431	2,445,962	2,499,603
Ohio	7,649,909	7,677,044	7,847,658
Oklahoma	3,939,478	3,952,012	4,030,822
Oregon	2,470,842	2,480,371	2,540,283
Pennsylvania	7,480,070	7,505,264	7,663,677
Puerto Rico	5,594,387	5,603,199	5,658,609
Rhode Island	754,094	756,997	775,251
South Carolina	4,291,462	4,302,384	4,371,057
South Dakota	2,516,695	2,525,791	2,582,983
Tennessee	6,404,242	6,422,424	6,536,741
Texas	8,872,600	8,899,685	9,069,983
Utah	1,163,165	1,167,310	1,193,374
Vermont	1,239,850	1,244,456	1,273,415
Virgin Islands	656,922	659,504	675,738
Virginia	5,310,606	5,325,912	5,422,149
Washington	2,928,383	2,939,150	3,006,851
West Virginia	3,092,014	3,100,987	3,157,408
Wisconsin	6,212,219	6,234,753	6,376,442
Wyoming	1,048,236	1,052,202	1,077,136
No. Mariana Islands	620,969	623,383	638,568
Sub-total	199,521,331	200,172,211	204,264,691
3(b) Special Needs	1,544,909	1,544,909	1,544,909
3(c) Fed'l Admin.	5,822,760	5,849,880	6,020,400
Total	206,889,000	207,567,000	211,830,000

TABLE IA
APPROPRIATION FOR PAYMENTS TO STATES
PESTICIDE IMPACT ASSESSMENT, FY 1989 - 1991

Smith-Lever Act: Section 3 (d)	FY 1989	FY-1990	Total Proposed for FY 1991
Alabama	$ 24,287	$ 24,287	$ 24,287
Alaska	8,491	8,491	8,491
Arizona	17,980	17,980	17,980
Arkansas	37,917	37,917	37,917
California	82,862	82,862	82,862
Colorado	18,976	18,976	18,976
Connecticut	11,155	11,155	11,155
Delaware	10,940	10,940	10,940
Florida	34,080	34,080	34,080
Georgia	53,195	53,195	53,195
Guam	8,620	8,620	8,620
Hawaii	11,177	11,17	11,177
Idaho	18,770	18,770	18,770
Illinois	75,047	75,047	75,047
Indiana	39,000	39,000	39,000
Iowa	72,061	72,061	72,061
Kansas	32,535	32,535	32,535
Kentucky	21,032	21,032	21,032
Louisiana	23,126	23,126	23,126
Maine	13,573	13,573	13,573
Maryland	16,505	16,505	16,505
Massachusetts	14,331	14,331	14,331
Michigan	31,916	31,916	13,916
Minnesota	48,656	48,656	48,656
Mississippi	38,171	38,171	38,171
Missouri	35,076	35,076	35,076
Montana	16,419	16,419	16,419
Nebraska	48,392	48,392	48,392
Nevada	9,744	9,744	9,744
New Hampshire	9,552	9,552	9,552
New Jersey	14,796	14,796	14,796
New Mexico	11,847	11,847	11,847
New York	29,003	29,003	29,003
North Carolina	43,402	43,402	43,402
North Dakota	20,430	20,430	20,430
Ohio	39,700	39,700	39,700
Oklahoma	26,451	26,451	26,451
Oregon	20,264	20,264	20,264
Pennsylvania	24,268	24,268	24,268
Puerto Rico	8,519	8,519	8,519
Rhode Island	10,400	10,400	10,400
South Carolina	25,400	25,400	25,400
South Dakota	19,430	19,430	19,430
Tennessee	22,795	22,795	22,795
Texas	73,493	73,493	73,493
Utah	11,519	11,519	11,519
Vermont	10,193	10,193	10,193
Virgin Islands	8,987	8,987	8,987
Virginia	22,933	22,933	22,933
Washington	26,116	26,116	26,116
West Virginia	11,408	11,408	11,408
Wisconsin	33,276	33,276	33,276
Wyoming	10,774	10,774	10,774
Sub-total	$1,409,000	1,409,000	1,409,000
Special Projects	224,000	224,000	224,000
Undistributed	- -	928,000	1,947,000
Total	$1,633,000	$2,561,000	$3,580,000

TABLE IB
APPROPRIATION FOR PAYMENTS TO STATES
FOOD AND NUTRITION EDUCATION, FY 1989 - 1991

Smith-Lever Act: Section 3 (d)	FY-1989	FY-1990	Total Proposed FY-1990
Alabama	$1,909,987	$1,898,566	$722,752
Alaska	167,319	166,106	61,792
American Samoa	58,834	57,859	--
Arizona	540,929	536,643	197,872
Arkansas	1,217,178	1,209,822	460,313
California	3,176,441	3,146,396	1,130,993
Colorado	536,142	531,838	195,929
Connecticut	437,352	433,749	158,993
Delaware	214,036	212,499	79,289
Florida	1,962,548	1,947,329	720,809
Georgia	2,078,891	2,066,330	786,905
Guam	58,980	57,988	--
Hawaii	249,260	247,520	92,897
Idaho	282,209	280,138	104,561
Illinois	2,054,606	2,039,188	757,745
Indiana	1,161,060	1,153,427	436,985
Iowa	872,584	867,380	332,009
Kansas	669,282	664,678	250,361
Kentucky	1,604,610	1,594,827	606,113
Louisiana	1,805,330	1,793,083	672,209
Maine	406,907	404,231	153,161
Maryland	812,655	806,672	300,905
Massachusetts	935,358	928,001	343,673
Michigan	1,719,074	1,707,403	643,049
Micronesia	63,224	61,728	--
Minnesota	958,948	952,705	361,169
Mississippi	1,651,913	1,642,074	623,609
Missouri	1,498,087	1,488,317	563,345
Montana	286,603	284,558	106,505
Nebraska	520,090	516,722	195,929
Nevada	164,957	163,589	59,849
New Hampshire	229,893	228,189	85,121
New Jersey	1,030,817	1,022,187	374,777
New Mexico	490,213	486,539	180,377
New York	3,275,257	3,247,725	1,189,313
North Carolina	2,436,917	2,423,266	930,761
North Dakota	332,701	330,654	125,945
Ohio	2,114,874	2,100,119	788,849
Oklahoma	1,013,662	1,006,744	378,665
Oregon	474,736	470,823	172,601
Pennsylvania	2,598,069	2,580,347	973,529
Puerto Rico	1,349,553	1,329,858	415,601
Rhode Island	292,421	290,345	108,449
South Carolina	1,472,586	1,464,288	561,401
South Dakota	375,477	373,104	141,497
Tennessee	1,908,453	1,896,952	722,753
Texas	4,047,981	4,020,306	1,512,017
Utah	297,019	294,621	108,449
Vermont	226,837	225,349	85,121
Virgin Islands	58,190	57,292	--
Virginia	1,630,076	1,620,178	617,777
Washington	653,952	648,670	238,697
West Virginia	942,695	937,064	357,281
Wisconsin	922,737	916,171	343,673
Wyoming	182,087	180,801	67,625
No. Mariana Islands	57,683	56,842	--
Sub-total	58,490,280	58,069,800	21,600,000
Fed'l Admin	144,720	127,200	--
Total	58,635,000	58,197,000	21,600,000

TABLE IC
APPROPRIATION FOR PAYMENTS TO THE 1890 LAND-GRANT COLLEGES AND TUSKEGEE UNIVERSITY FY 1989 - 1991

INSTITUTION	FY-1989	FY-1990	Total Proposed for FY 1991
ALABAMA:			
Alabama A&M Univ.	$ 957,792	$1,133,166	$1,195,300
Tuskegee Univ.	957,792	1,133,166	1,195,300
ARKANSAS:			
University of Arkansas at Pine Bluff	854,233	1,019,601	1,078,194
DELAWARE:			
Delaware State College	315,925	371,400	391,057
FLORIDA:			
Florida A&M Univ.	770,688	926,246	981,359
GEORGIA:			
Fort Valley State College	1,120,609	1,342,659	1,421,335
KENTUCKY:			
Kentucky State Univ.	1,393,496	1,681,963	1,784,164
LOUISIANA:			
Southern University and A&M College	796,120	940,926	992,234
MARYLAND:			
Univeristy of Maryland Eastern Shore	609,787	720,826	760,164
MISSISSIPPI:			
Alcorn State Univ.	969,275	1,131,140	1,188,489
MISSOURI:			
Lincoln University	1,367,832	1,668,648	1,775,232
NORTH CAROLINA:			
North Carolina A&T State University	1,713,983	2,030,289	2,142,349
OKLAHOMA:			
Langston University	830,324	1,004,059	1,065,616
SOUTH CAROLINA:			
South Carolina State University	843,346	990,495	1,042,631
TENNESSEE:			
Tennessee State University	1,284,727	1,529,863	1,616,715
TEXAS:			
Prairie View A&M University	1,686,778	2,046,539	2,173,998
VIRGINIA:			
Virginia State University	1,086,653	1,291,574	1,364,183
Subtotal	17,559,360	20,962,560	22,168,320
Fed'l Administration	731,640	873,440	923,680
TOTAL	$18,291,000	$21,836,000	$23,092,000

TABLE II
APPROPRIATION FOR PAYMENTS TO STATES
BASIS OF ALLOTMENT AND MATCHING REQUIRED
FISCAL YEAR 1991

ITEM	TOTAL ESTIMATE 1990	ALLOTMENT	AMOUNT PAID W/O MATCHING	AMOUNT REQUIRED MATCHING
Smith-Lever Act: Sec 3b	246,535,000	56,475,091-Fixed by Sec 3b PL 87-749	14,513,808	41,961,283
		1,544,909-Spec'l Need	—	1,544,909
Sec 3c		(153,810,000) 58,915,840-farm pop. 58,915,840-rural pop. 29,957,920-equally & 6,020,400 for Fed's admin. & coord. Sec 3c.)	7,020,400	146,789,600
Federal Employees Retirement sys		4,000,000-Fed's contr.	4,000,000	--
Retirement & Employee Compensation Cost		15,252,000-Fed'l contribution	15,252,000	—
Penalty Mail		15,453,000 Reimbursement to Post Office	15,453,000	--
Section 3d	59,844,000	21,600,000-EFNEP	21,600,000	—
		12,000,000-Priority	12,000,000	--
		7,164,000-IPM	7,164,000	—
		15,500,000-Water Qual.	15,500,000	—
		3,580,000-PIA	3,580,000	—
Title XIV, Food/Ag Act 1977, as amended, 1890 Colleges	23,092,000	(23,092,000) 923,680-Fed'l Admin 22,168,320-To 1890 Colleges & Tuskegee	23,092,000	—
Sec. 1416, Facilities Grants	9,508,000	(9,508,000) 380,320-Fed's Admin 9,127,680-To 1890 Colleges & Tuskegee	9,508,000	--
D.C. Public Postsecondary Education Reorganization Act	1,000,000	(1,000,000) 40,000-Fed'l Admin 960,000-To Univ. D.C.	40,000	960,000
SUBTOTAL	339,979,000	339,979,000	148,723,208	191,255,792
Fed'l Admin	5,697,000			
Total, FY90	345,676,000			

STATUS OF PROGRAM

NEW DIRECTIONS FOR THE COOPERATIVE EXTENSION SYSTEM

I. Current Activities:

The Mission of the Cooperative Extension System is to help people improve their lives through an educational process which uses scientific knowledge focused on issues and needs.

As a national educational network, Extension seeks to answer society's questions through the diverse resources of our Nation's land-grant colleges and universities.

Extension addresses issues of wide public concern, and thus, it deals with groups that vary in gender, race, age, income level, occupation, family status, religion, and other characteristics. Extension successfully works with these changing client groups as it identifies the issues at hand.

Extension uses technologies such as satellite transmissions, computer-assisted instruction, and interactive video as creative ways to make learning come alive for Extension audiences.

These educational technologies allow Extension to tailor programs to the needs of specific individuals and groups.

Extension is skilled in the early detection of emerging critical issues, and this allows Extension programs to be well underway even before the issue is an important item on the public agenda. Extension programs prevent crises rather than react to crises.

Extension also is skilled at building teams of experts from various disciplines to deal with critical issues. The team approach provides a strong, comprehensive knowledge base for developing Extension programs.

Receptive and responsive to the needs of others, Extension faculty and staff demonstrate a belief in people and the desire to help others improve the quality of their lives. They are educational leaders with the ability to create a vision and move others towards a better future.

Our mission and vision constitute a new direction for the Nationwide Cooperative Extension System. The future is positive, and this system looks forward to being a component for positive change by making a difference related to priorities and issues of people.

In support of these, the Cooperative Extension System currently addresses the following priority initiatives efforts throughout the country. These National Initiatives are creating a new agenda for the Extension System in realistically addressing problems as well as in developing opportunities in agriculture and related areas:

- Water Quality
- Youth-At-Risk
- Revitalizing Rural America
- Building Human Capital
- Competitiveness and Profitability of American Agriculture
- Alternative Agricultural Opportunities
- Improving Nutrition, Diet, and Health
- Conservation and Management of Natural Resources
- Family and Economic Well-Being

II. Selected Examples of Recent Progress:

WATER QUALITY

Over 95 percent of the Nation's rural residents depend upon groundwater for drinking water; as does over one-half of our total population. These groundwater supplies are sometimes contaminated, and much more frequently, are perceived to be jeopardized by chemicals. Agricultural chemicals (e.g. pesticides and nitrates) are often cited as major problems.

Public education programs are needed to address a wide range of groundwater topics. These include the nature of the groundwater resources; the impacts of agricultural, household and industrial chemicals on the water resource, on water uses, and on water users; the development of appropriate policies to protect or enhance water quality; and the development and implementation of programs to conserve water as a quality enhancement strategy.

The Cooperative Extension System has implemented a wide range of programs to address these challenges.

In cooperation with the SCS, three regional workshops was conducted in October and November 1988 to begin the development and implementation of state water quality action plans. These were held in Fort Worth, TX; Raleigh, NC; and Philadelphia, PA. They marked the beginning of formal joint water quality efforts.

During FY 89, an interagency coordinating committee, chaired jointly by ES and SCS and including representatives from ARS, CSRS, ERS, FS, NOAA, EPA and USGS has been implemented to assure coordination among agency water quality programs.

In New England, Cooperative Extension has developed a multi-state consortium that is developing a computer - based expert system that will assist users of agricultural pesticides in making decisions about choosing pesticides that will have minimal effects on groundwater quality, based on the chemical and physical properties of both the pesticides and the farmers' soils. These systems will be available for use in every county office, for use by the Cooperative Extension System, SCS, ASCS, pesticide dealers, crop consultants and farmers.

In the South, Cooperative Extension has organized and conducted a regional water training workshop, to encourage the diffusion and sharing of program materials among Extension educators in the southern states. The workshop emphasized four major areas; toxic substances, public policy education, water supply and waste management, and solid waste management. It also included invited participants from other regions, who shared and demonstrated new programs, techniques, and approaches to accelerated public education.

The North Central region has developed a regional training workshop to train both Extension and SCS staff in the use of a farmstead assessment that will identify potential water quality problems and facilitate the development of appropriate preventive measures for farmer adoption to protect or enhance groundwater quality.

In Montana, Cooperative Extension has implemented a program to increase farmer awareness of groundwater quality. In cooperation with the Montana Farm Bureau, a series of twelve water quality fact sheets have been distributed to the great majority of the state's rural residents; and nearly 7,000 rural residents have tested their water supply wells for coliform, nitrates and other contamination indicators.

Southern University and the Louisiana Cooperative Extension Service reported that water quality programs in 32 Louisiana parishes, involving approximately 30,000 families have become more aware and knowledgeable about insuring the quality of water for family consumption.

Thirty-two advisory committees have been organized to address the problems and issues identified. Approximately 32 parishes collected data to provide a situational statement to the advisory committee and resource data for program development. In addition, nineteen educational tours were conducted on water plants and water purification facilities in 19 parishes. Approximately 407 older citizens, adults, youth and family members attended the tours. They acquired invaluable knowledge and experience in observing the stages and processes of ensuring wholesome drinking water. They interacted with the management of water plants and acquired more knowledge of problems encountered in preserving the quality of water used for consumption. Four hundred sixteen homemakers, farmers, youth, adults and older citizens improved knowledge and skills in purifying water, water conservation, and how to remove water stains on fixtures in the home.

YOUTH-AT-RISK

The Extension Service (ES) and the Cooperative Extension System (CES) established a National Task Force on a new initiative on Youth-at-Risk. This initiative focuses on the problems facing youth today including drugs, school dropouts, teen pregnancy, illiteracy, child abuse and neglect. The Youth-At-Risk Task Force studied these symptoms carefully and identified their primary causes as lack of parenting, poverty, and negative peer pressure. This national neglect of children and families has led to costly programs for addiction, welfare and incarceration. Educational programs which focus on the positive development of youth plus skills for parents and community leaders not only offer opportunities for youth to reach productive adulthood, but are less expensive than treatment programs and within the range of expertise for the Extension System to lead.

The Youth-At-Risk Task Force identified collaboration, cooperation, and community capacity-building as three major strategies to employ in prevention and intervention programming.

Through the Cooperative Extension System's Youth-At-Risk initiative, four regional workshops were conducted with participation from 260 Extension staff members who are implementing additional programs to reach a much larger projected Youth-At-Risk audience.

Unhealthy parenting practices, including child abuse, results in children with poor self concepts, socially unacceptable behavior, educational under-achievement, and poor social relations. In proactive Children at Risk programming to prevent such risks for children, 90,131 parents and more than 8,000 child care providers were reached.

Model programs include:

SPACES: Preparing youth for a high tech and global future. A Michigan-developed program, with funding by W. K. Kellogg Foundation, is designed for adolescents (9-15) to enter the world of the future with the confidence and skills they need to succeed. This program provides experiences in three critical areas: science and technology, personal coping skills and global issues. The program reached 7,500 youth and 750 volunteers in 1989. A curriculum package titled "Help Me - I'm Growing Up! Understanding Early Adolescents" includes videotape, guides and workbook.

PACT (Parents and Adolescents Can Talk): Through the PACT program, young people build positive self-concepts and improve their interpersonal communication and decisionmaking skills. These skills enable them to exercise greater responsibility over their sexual behavior and to resist media peer pressure to become sexually active. The major thrust of PACT is open communication between parents and youth. Developed at Montana State University with partial funding by the U.S. Department of Health and Human Services, PACT can be delivered in both community and school situations.

Among 500 Montana PACT participants, evaluation results reveal significant increases in parent-youth communication, increased knowledge of physiology and reproductive health, and a positive response overall to the program. Youth respondents report increased self esteem, and 89 percent of parents queried report increased self confidence in their parenting role. The PACT program leaves a cadre of adults within a community to continue leading and implementing local programs.

Tackling Tough Stuff: This curriculum of learning activities and experiences developed by the University of Minnesota to teach young people to recognize stress and depression and to take positive steps for self protection for themselves and their friends. The curriculum is designed for use with young people 12-17 years old with lessons, leader guides, and videotapes. 4-H or other youth group leaders can select lessons or individual exercises for use at club meetings, retreats, family programs or other events. Last year, 6,500 adults received training on the Tackling Tough Stuff Curriculum. It is estimated that those individuals worked with over 300,000 youth.

4-H CARES: A Kansas Extension Service program designed as a chemical abuse resistance education series has been pilot-tested and distributed to other youth organizations and schools. This program enables elementary school students to develop self confidence and communication skills, clarify values and set goals, make decisions, learn refusal skills against drugs, and develop skills in supporting peers. 4-H CARES received special funding from the Governor's office to support this prevention education effort. The program was selected as one of 20 exemplary preventions programs by the Office for Substance Abuse Prevention, the National Association of State Alcohol and Drug Abuse Directors, and the National Prevention Network. Last year approximately 2,000 youth were involved in the program from Kansas. Over 500 curriculum books have been sold to other organizations and agencies in the United States.

University Collaboration: The South Carolina Youth Development Council is a new project recently funded by the W. K. Kellogg Foundation. This new collaborative project brings together the following: Clemson University, South Carolina State College, The National Dropout Center, State agencies and youth. The innovative 22-member council is linked to local groups for needs assessment, program delivery, and evaluation of impact. The Kellogg Foundation's support has been matched with University and State resources to form an $8 million effort over the next four years.

ROTA (Reaching Out For Teen Awareness): Teens really do listen--but usually only to each other. The University of Maine's Cooperative Extension Service recognized a need to educate teens about the problems and pressures they face. So, Reaching Out for Teen Awareness (ROTA) was born. ROTA lets teens teach each other through the performing arts. Teen volunteers are trained to act out situations they face every day and to show other teens how to make the right choices about suicide, drinking, teen pregnancy, peer pressure, drugs, stress, and many other problems. Participants gain self-confidence and get the satisfaction of knowing they're helping other teens. The audience reactions? "I thought it was neat how we were able to participate and say what we felt," said one teen. "The scenes help you see how other people feel in difficult situations," another responded.

REVITALIZING RURAL AMERICA

Diversity among rural communities complicates the task of designing a national rural revitalization effort. While some rural areas critically need assistance, others do not, and the kind of assistance needed varies from state to state and from community to community. Such a situation call for a more proactive role for individual state governments to address rural concerns. It also calls for the closer involvement of a county-based organization like the Cooperative Extension System. Extension RRA programs support rural revitalization efforts by providing a perspective, developing knowledge and skills, and helping to shape the decision-making environment necessary to create rural opportunities.

As a national system Extension has the technical expertise and organizational structure to undertake rural revitalization. Through ties to the nation's land grant colleges and universities, and other sources of knowledge and research, the Extension Service provides the leadership in the application of knowledge to local situations. Extension's national initiatives on revitalizing rural America focus on building the capacity of communities, and businesses, to understand and apply new knowledge to deal with continuous transition in rural America.

Stewards to 90% of the nations natural resources, home to one in four Americans and three out of four units of government, rural America, however, possesses lower average incomes, slower job growth, continuing out-migration, substandard housing, lower educational attainment, poverty, and overburdened community leadership. Rural revitalization policy and programs are required to address not only rural economic change, but also attendant social, technical, and global change.

Extension information/education programs can help rural Americans understand global economic issues, help in sustaining and creating rural enterprises, and local jobs that generate local income and enhance public revenues. Extension assists public decision makers (national, state, local) concerned about rural areas establish their own rural revitalization policy and action programs.

Extension's accessibility, diversity, flexibility, and responsiveness is a key rural resource, as reflected in the following:

New York — An integrated research/extension thrust by Cornell Extension Service established the Innovative Industrial Extension System to support local industries in adoption of new technologies and for in firm human resource education programs. Some 4,000 businesses have been counseled, 2,000 jobs created due to expanding business, and energy audits of 21,000 firms resulted industrial energy conservation.

Kentucky — The Cooperative Extension Service launched a concerted manpower development and assistance effort for farmers and those who do not rely on agriculture as a source of income. Program results include the training of 50 community leaders, the improvement of job skills among 16,000 residents, and 600 farmers received manpower development assistance.

Illinois — An Illinois Extension program to strengthen community economic development in rural areas added over 400 community volunteers capable of doing economic development analysis, analyzed 100 communities concerning needs assessment and community service provision, and through career education, improved job placement for over 5,000 dislocated rural residents.

New Mexico — Recognizing the importance of developing quality leadership, the New Mexico Local Government Education Program has been effective in increasing the knowledge base of 220 county officials and increased the efficiency of 33 government units.

Minnesota — Minnesota Extension Project Future links the community to local, regional, and national programs that support action for rural development. It brings community leaders together to discuss the current economic situation of the community, and to work to eliminate, or deal with, weaknesses that inhibit economic development and exploit the strengths that promote progress. Twenty-five communities a year participate, creating over 200 new jobs.

Oklahoma — In Oklahoma, Extension assists rural enterprises improve profits through the use of computer programs. Impact reports indicate the program has helped reduce cost, improve profits, and improve overall management for 1,500 enterprises.

North Dakota — A successful business incubator was established with the assistance of NDSU-Extension in Cass County. The incubator assists with new and developing businesses in the first crucial years of operation and the potential for future growth in the greater Fargo market area.

Arkansas -- Priority objectives resulted in Extension efforts that impacted employment in 25 rural communities (extended 1,500 jobs and created 500 new jobs). New career opportunities for local residents reached 1,000 students and 250 adults.

Iowa -- An emphasis on the community leadership (Tomorrow's Leaders Today, Family Community Leadership, Minnesota/Iowa Leadership Empowerment for Agricultural Development, and Youth Committed to Action) assisted 7,150 participants develop leadership skills that mobilized the efforts of 209 communities and 355 organizations. As a result, 143 projects were initiated and 73 implemented in support of Iowa's economy and future.

Nebraska -- Managing Main Street Businesses is an effort to augment small business management skills in rural Nebraska. The program operates in 36 counties, involving over 293 businesses. Emphasis is placed on improving the viability of existing businesses through community efforts, and has created or saved over 500 jobs a year.

Wisconsin -- Sixty-four communities benefited from Extension's efforts in assessing the perceived needs and problems for small communities. County agent needs assessment surveys uncover the purchasing behavior of local consumers, a need to keep residents shopping in their community. Subsequently, the profits of 2,400 businesses have been increased, 800 new businesses started and 40 communities started or expanded community marketing efforts.

Pennsylvania -- A specific focus for Pennsylvania's Extension Service has been the management of community resources. Impacts include 10,000 clients reached, 50 communities conducted systematic business needs assessments, and twenty steering committees organized to evaluate rural community needs.

BUILDING HUMAN CAPITAL

Building Human Capital means helping people increase their ability to reach their full potential. Educational programs focus on increasing the quality of individuals involvement in families, organizations, communities, and the work place. The Human Capital initiative provides people with the understanding, skills, and ability to cope more effectively with the constant changes occurring around us. Several efforts under this initiative included the following:

The 4-H Aerospace Design Team, is a multi-state, multi-agency partnership, with the 4-H youth programs to create innovative, futuristic curricula specifically designed to prepare youth for the 21st Century. Partners include FAA, NASA, NOAA, CAP, USAF, GAMA, the Smithsonian Aerospace Museum, U.S. Space Foundation, National Science Foundation, Estes Rocket Co., and McDonnell Douglas Company. Model programs are now being completed in Pennsylvania, Wyoming, California, Michigan, Florida, Ohio and New York. It is projected that within three years, age specific curriculum will be available nationwide.

Combining Federal and State funding, with grants from the W. K. Kellogg Foundation, have resulted in the development of curricula, training programs and support systems for volunteers serving in key leadership and middle management roles. Over 25,000 volunteers in 42 states and territories received training in middle management systems, advisory boards, council and committees and youth volunteerism, through the Volunteers For the Future Program. In the Family Community Leadership Program, volunteer trainers in 46 States and Guam received 30 hours of training in public policy and leadership. In North Carolina, 3,678 volunteers completed training in FCL during the past year.

In Colorado, a state invitational conference was held on Youth Serving as Advocates for Youth. Teams of adults and youth were trained as leadership trainers to prepare youth to identify needs and develop programs for youth in their communities. More than resources, youth are being viewed, not as the leaders of tomorrow, but as leaders of today in helping communities respond to the needs of youth.

In Georgia, a Family Job Counseling Clinic Model was co-sponsored by Extension and the Department of Employment Service. A follow-up study is now being conducted to ascertain the number of family members who received employment as the result of their participation in the clinic.

Making the Grade is a national project co-sponsored by ABC-TV and the National Collaboration for Youth. The project is a campaign to raise public awareness and stimulate community action in response to the needs of youth. Town summit meetings were conducted as a follow-up to a September 14, ABC-TV aired primetime news special "Survival Stories: Growing Up Down and Out". The town meetings brought together local political leaders, educators, parents, youth advocacy groups, business leaders, and church groups. Members of the National, State and local Building Human Capital initiative teams, and 4-H salaried and volunteer staff, were responsible for organizing 200 to the 400 town meetings held across the country.

Another focus of the "Building Human Capital" initiative is on Master Volunteers. To become "Masters," volunteers are required to complete intensive subject-matter training. In return, volunteers agree to assist in teaching others, respond to questions from the general public, and share what they learn with other clientele. In agriculture, Master Gardeners and Master Pesticide applicators play significant roles. Home Economics Master Volunteer programs are active in over 30 States in areas such as food preservation and nutrition, health management, and parenting and family life skills. The 4-H Program focuses on management, training, and supervisory capacities with other volunteers. Last year, over 2,000 volunteers were involved in a comprehensive pilot program intended to improve teaching skills. The program, "T3 - Training Trainers to Teach," is a 30-hour program to prepare trainers as more effective teachers of other volunteers and youth. It is estimated that 20,000 volunteers will receive training in the T3 curriculum beginning in October, 1989.

COMPETITIVENESS & SUSTAINABLE AGRICULTURE

Agriculture is in an era of transition in which it has and continues to experience, change more extensive and more far-reaching in its implications than at any time in previous history. Central to this change is internationalization of the agriculture economy, inseparably tying the competitiveness of American agriculture to the ability of farmers to understand and effectively participate in global markets. Also, the globally competitive agricultural systems essential to meet this challenge must not only satisfy the economic but the environmental and social expectations of most, if not all, publics having a stake in them.

In response to this challenge, the Cooperative Extension System has identified major sources of information and services for helping farmers and small businesses participate in international markets, in conjunction with the Foreign Agricultural Service, Department of Commerce, Small Business Administration, World Trade Centers, University Trade Centers, State Departments of Commerce and Agriculture and numerous other public and private organizations. The Extension Service-USDA, in cooperation with State Extension Services, is facilitating a network of public and private organizations in pooling information resources and talent in pursuit of increasing exports by farmers and rural businesses. This catalytic role has resulted in examples such as $1 million of the dried flower babies breath exported from the State of Washington to Japan and $7 million of sea urchin eggs exported from California to the Pacific Rim. However, the major accomplishment has been the incorporation of the delivery mechanism of Cooperative Extension into creating awareness of global marketing opportunities in agriculture and rural America and creating competencies to participate in global markets.

During a performance test at the University of Arkansas-Pine Bluff, computer program was released to 25 counties. A performance test program handbook and computer user's handbook were developed and sent out to these counties. One training session was conducted on performance testing at the annual beef cattle in-service training session. One fact sheet was released on cow herd performance testing during FY'88. Five sets of cattle scales were received (1890 funds) at the end of the FY'88 for use by counties in the state for performance test work. The records of herds on test were completely reworked during FY'88. Herds were listed under two number systems, some herds were using other herds' numbers and some had two or three assigned numbers. All herds are now identified to one herd number.

To help agriculture meet the economic, environmental, and social criteria of sustainable agriculture, the Cooperative Extension System is:

1. Broadening the scope of IPM. For example, the Oklahoma Alfalfa Integrated Management program links animal science, Haymarket (an interdisciplinary marketing initiative), producer associations, and Integrated Pest Management program. As a result, forage buyers receive a superior product, growers lower chemical use, and net $4.50 more per ton of alfalfa sold through the system.

2. Expanding the use of Integrated Management programs. Some examples are:

   - The Texas Total Ranch Management program has rescued failing ranching operations, increased returns per acre by 50 percent or more, and prevented losses of more than $200 million to cattle producers during the 1988 drought.

   - The Arkansas Cotton Research Verification Trails Program shows that total cost per pound of lint (excluding land, farm overhead, and management charges) were reduced from 57 cents in 1980 to 37 cents in 1988.

   - Intergrated beef cattle management program results show an increase in net income of $170 per beef cow in Colorado and an annual average increase in net income of $1,919 per beef cattle herd in Iowa.

   - An evaluation of GOSSYM-COMAX, an expert cotton production system, implemented by the Extension Service (ES), ARS, and Clemson, South Carolina and Mississippi State Universities showed that users net an additional $40 per acre.

3. Implementing the Agriculture Productivity Research Subtitle of the 1985 Food Security Act, in conjunction with the Cooperative State Research Service. This legislation referred to as Low-Input Sustainable Agriculture (LISA) has resulted in funding 78 (LISA) projects in 1988 and 1989. The application of the dedicated funds provided through this legislation, coupled with a 3-5 fold match by both public and private research and education organizations and agencies, has resulted in major changes in the commitment and capacity of land grant universities and USDA research and extension to address sustainable agriculture issues. Thirty-five or more State Extension Services now have sustainable agriculture educational programs which seek to strike a balance between economic and environmental factors in the short and long term. Examples of the approaches being taken through these programs are:

   - Using demonstrations comparing traditional high-input systems with low-input systems.

   - Identifying practices being tested by farmers that appear to be workable and provide potential methods for improving sustainability and communicating this information to both researchers and other farmers.

   - Identifying and disseminating acceptable substitute practices to continue agricultural operations in the face of stricter pesticide laws.

- Establishing centers for sustainable agriculture in several States to accentuate the development of economical, environmentally-sound, and socially-acceptable agricultural systems.
- Expanding IPM beyond the original concept of managing pests to sustainable agriculture goals and allowing IPM constituencies to see sustainable agriculture as an improved and expanded system in the public interest.

ALTERNATIVE AGRICULTURAL OPPORTUNITIES

Extension works with farmers, ranchers, processors, and distributors to develop systems which will bring quality products into new or penetrable markets. One of the most valuable roles Extension may play in this process is to broker new relationships among the public and private sectors, and between those who conduct research and those who use these results. Through the initiative in Alternative Agricultural Opportunities (AAO) results may include--aiding rural revitalization through local value-added to agricultural products; addressing environmental issues with less polluting, natural products from agriculture; and converting our consumption to products generated from renewable resources.

Commercialization of new products requires systematic progression from research to development and from development to demonstration--a process very similar to the one we use with agricultural production. In the context of commercialization of new products, however, a much broader scope of activities is involved, with different mix of stakeholders, and different sets of technology and social science databases.

Examples of new partners include--National Association of Wheat Growers and National Corn Growers Association who held and are planning additional conferences on alternative utilization of commodities. The Association for the Advancement of Industrial Crops has also been formed and held its first annual conference in October 1989. Archer Daniels Midland and other large agribusiness firms are devoting significant resources to the development and application of technologies which utilize agricultural commodities as feedstocks for utilitarian products such as biodegradable plastics, and ethanol and ethanol-derived fuels. USDA Agricultural Marketing Service, Women Involved in Farm Economics, and other organizations are involved in investigation, marketing, and promotion of food-quality dried distillers grains as a value-added component in an ethanol system.

Within Extension-- The Minnesota Center for Alternative Plant and Animal Products, in cooperation with the ES/USDA, the National Agricultural Library, and others, is developing a database as an instantaneous resource for developing educational materials dealing with the production and commercialization of alternative crops and products. Other States are currently being surveyed for input to the database. The product will be a computerized database which can be distributed to any interested user.

North Carolina Cooperative Extension Service, with leadership from North Carolina A&T University and in cooperation with the ES/USDA, is developing a research and knowledge taxonomy for AAO. The difficulties in communicating within and across the unfamiliar areas of AAO will be facilitated by this project. The outcomes of this work will support database development in AAO, identify appropriate research agenda, and help create external linkage/resources. The taxonomy products have been reviewed by the General Accounting Office and Small Business Administration; and other USDA agencies such as The Cooperative State Research Service, Agricultural Research Service, and others within the department.

The Farming Alternatives Project at Cornell University (New York), in cooperation with the ES/USDA, conducted a workshop to enhance the capability of CES staff to offer programs in AAO. The workshop introduced participants to materials and strategies for AAO program delivery and built linkages with other public and non-profit agencies. Unique and Diverse: Educational Programs for Alternative Agriculture in the Northeast was the theme of the workshop. The 90 attendees represented 2 countries, 15 states, and 14 agencies.

The Texas Agricultural Extension Service, with significant involvement by Extension partners from Prairie View A&M University, has intensified educational efforts in alternative enterprises for ranchers. Program evaluators have documented horizontal and vertical diversification for ranch operations in 100 Texas counties. Highlights from the Texas program include:

- Assessment of veal production from excess dairy calves.
- Increased use of silage by Texas dairymen provides market for additional forage commodities.
- Diversification from cow/calf to stocker operations.
- Alternative cultural practices in beef herd management improved income 12 to 100 percent over four years.
- Pork Profit Program to diversity production management.
- Utilization of cull range ewes.
- Helping horse industry respond to passage of pari-mutual betting.
- Development of native pecan groves into commercial orchards by ranchers.
- Catfish and tilapia culture by livestock producers.
- Exotic wildlife for meat or sport hunting.

A crambe/rapeseed demonstration project in Nebraska has demonstrated production methodologies, involved the Nebraska Non-Food Research Center in investigations of product use, evaluated local processing plants for feasibility of trial runs, established interstate communication via and electronic bulletin board, conducted a production conference (including production of a videotape), increased foundation seed stocks to meet needs, worked toward labels for required pesticides, and investigated utilization of coproducts.

The shiitake mushroom project in Virginia has focused on production and marketing of a new product, shiitake mushrooms. Clientele may use an underutilized resource, hardwood logs, and their own manual labor to earn profits. Over 200 landowners in Virginia have established a commercial mushroom production enterprise on their farms. In 1988, over 100,000 pounds of shiitake worth $400,000 wholesale was grown and sold.

IMPROVING NUTRITION, DIET AND HEALTH

With the renewed interest in food safety, Extension Service has focused more resources on food safety education programs for all members of the food chain from producer to consumer. These resources include new and redirected financial support and staff time, increased staff training, new educational materials and increased programming.

Extension's food safety education for producers emphasizes safe production practices, safe use of chemicals, implementing regulatory requirements, reduction of microbiological load and alternative production practices. Examples of national programs include: Integrated Pest Management, Pesticide Applicator Training, and the Food Animal Residue Avoidance Databank. In addition, Extension's agricultural production programs incorporate safe production practices. Last year, a series of videotapes on biosecurity were developed to prevent introduction of salmonella and other potential microbiological contaminants in poultry flocks.

Education programs for food processors and handlers have ranged widely in emphasis. Oregon State has been involved in a comprehensive program to reduce the potential for listeria contamination in a variety of industries. This program includes surveillance, identification of potential sources, providing engineering consultation and education of plant managers and employees in safe processing and handling methods. North Carolina had been conducting a training and certification program for food service managers. This program consists of a two to three day workshop that covers the principles of safe food preparation and handling. As part of the workshop, the managers receive training materials which they then use to train their own employees. As a result of the program, more than 90 percent of the participants have passed a national certification program.

Extension food safety education programs for consumers focus on providing consumers with research-based information on issues of current concern, increasing understanding of basic food safety principles and improving skills in safely handling and preparing foods in the home. It is estimated that annually, Extension answers approximately 6 million telephone inquiries, reaches 45 to 50 million through the media, distributes several million fact sheets and reaches 10 million program participants with programs and information that cover the basic principles of food safety.

During this last year, several new food safety programs were implemented; following are some examples. Colorado developed a videotape intended to help consumers analyze risks from pesticides in the food chain. New York conducted a risk communication workshop for representatives of all sectors of the food chain to help improve risk communication about residues of agricultural chemicals on fresh produce. Washington State held forums for producers and consumers on the use and safety of growth promoting compounds in livestock and poultry. Delaware and Georgia both developed a newsletter series on food additives, residues, and new processing technologies. Kansas developed a videotape on basic issues related to chemical use in our food supply. During the past year, concern over pesticides in the food supply has been the subject of front page coverage. To strengthen the ability of Cooperative Extension staff to address these concerns, nearly one third of the State Extension Services have formulated food safety teams. To help support these teams, a number of electronic communication systems have been established to enhance the timely transmission of research-based information to educate consumers about areas of concern.

Food Safety Public Awareness Program - In cooperation with the Food Safety and Inspection Service, Extension Service has initiated the development and evaluation of various strategies to increase public awareness of basic food safety concepts. The project will look specifically at communication strategies and the impact these have on levels of knowledge and concern. In consultation with FSIS, EPA and FDA, Colorado State University will test a research-based message on food safety through a series of focus group interviews. This message will then be packaged into four different delivery methods. Each of these will be presented to focus groups across the U.S. and the relative impacts assessed. This study will provide Extension and others involved in risk communication with a better understanding of how to utilize communication media in the delivery of risk messages.

Food Handlers Education Curriculum - The rapid rise in the sale of pre-cooked refrigerated foods from supermarkets, and the relatively recent identification of pathogenic organisms which can grow at refrigerator temperatures, has raised a potential concern about the safety of these food products. Deli service operators are now handling an increased variety and volume of pre-prepared foods, which may be sold in raw or cooked form, to be eaten raw, reheated or cooked, depending on the food. In order to train these workers in proper food handling practices, the New York Extension Service signed a cooperative agreement with Cornell University Cooperative Extension to create a videotape, accompanying print materials and lesson plans which can be used to train new employees. The program will appeal to the individual's sense of pride, and will address the important role that the employee plays in keeping the food safe. Critical points in the operation will be highlighted, and necessary skills will be reinforced throughout the training experience. In addition to making the curriculum available throughout the Cooperative Extension System, it will also be available for sale to trade associations, supermarket chains, and individual grocers, thus extending its reach and usefulness.

New Hampshire's major thrust, "Cancer Risk Reduction Education Project," was enhanced with a $40,000 grant from the New Hampshire Division of Public Health Service. Almost 5,000 people were reached through direct contact and over 460,000 were reached through a major media effort.

A major objective of the National Extension Homemakers Council's program was to promote a healthier and safer environment. Members of this organization expended one and one-quarter million volunteer hours in planning, conducting and teaching in their communities. Food Buying, Gardening and Food Preservation programs were conducted by Master Volunteers. Other major topics for educational programs were: Safety Belt and Correct Child Seat Usage, Poison Prevention, AIDS, Nutrition and Fitness, Child/Elderly Abuse, Suicide Prevention and ALcohol/Traffic Safety Education for Youths and Adults.

Florida reported that 87% of the EFNEP enrolled homemakers saving an average of $5.95 per week on food for a yearly savings of $309.40 per homemaker. The potential population of limited income homemakers is many more that can be taught by the available 61.25 FTE paraprofessionals working on a one-to-one basis. By moving to group instruction and focusing on graduating them in 6 months, the number of homemakers per paraprofessional has been increased. The data indicated that the objective of improved program efficiency is being accomplished. During the past year, the number of homemakers being taught in groups has increased by 7%, and the number of homemakers graduating in less than 12 months has increased by 9%.

Texas EFNEP participants cited the impact of EFNEP on their families: "For the first time in six years my blood pressure is normal and my cholesterol is the lowest it has ever been. My husband's diabetes is controlled just by eating the right foods. I neyer understood which foods had more sugar. Thanks to the Expanded Nutrition Program my family enjoys better life."

"My family is in better health. My two small children are no longer anemic, my diabetes is controlled (because I can now follow the diet), my husband's blood pressure has come down (without medication) and my teenagers' complexion have improved - all this attributed to the good eating habits that we have changed to. We never knew the importance of the food we ate."

"I'm using a grocery list now. I have cut down on fats. I was using two 48 oz. jars of oil per week, now I'm hardly using one. I'm saving from $40.00 to $50.00 a week."

"I believe I was able to capture the importance of planning a diet using the 4 food groups, the many ways of preparing foods, the size of servings and something very important is to be able to explain to my family why it is necessary to do all these things."

"I was told how nutrients in food keep us healthy. Milk was not a part of our daily diet, now that I know how important calcium is for our bodies I make sure I serve it with our meals. I now practice cooking methods that cut down on fat and grease from some foods."

CONSERVATION AND MANAGEMENT OF NATURAL RESOURCES

The Conservation and Management of Natural Resources National Initiative (CMNR) has been supported by a wide variety of educational programs at the state level. While many states are busy preparing programs for emerging CMNR issues like waste management, global warming and biodiversity, nearly all states have focused on current issues such as wetlands protection, non-point source pollution, and economic and environmental sustainability of the natural resource base. The following examples of CMNR related programs are a sample of 1989 activities.

In New York, Cornell University Extension and the Soil Conservation Service are cooperating on a Pasture Management Outreach program for the State's dairy farmers and beef cattle producers. The program teaches farmers how to reduce their dependence on corn production by establishing and intensively managing grass-legume pasture. To date, approximately 400 of the State's dairy farms have incorporated permanent pasture into their management strategies without sacrificing milk production; converting from 20 to 60% of their cropland into pasture. These farmers are saving as much as $950 per year for each cow they milk. Participating farmers have improved soil stability and reduced their dependence on agricultural chemicals and machinery. Improved water quality and soil conservation will contribute to long-term environmental and economics sustainability.

West Virginia University Extension organized a conference last April focusing on "Income Opportunities for the Private Landowner Through Management of Natural Resources." The conference emphasized renewable natural resource based activities for farmers, woodlot owners, rural landowners, communities and businesses. Among the diverse topics included in the conference were hunting preserves, aquaculture, waterfowl opportunities and hunting access. Educational presentations dealt with starting and managing the enterprise, liability assessment, legal concerns and economics. The conference attracted 250 participants from federal and state agencies, businesses, professional and trade organizations, universities and rural communities. The participants will return with new ideas and approaches for natural resource management to 29 states, the District of Columbia and two Canadian Provinces.

In Texas, the eight-day "Total Ranch Management Shortcourse" was staged three times during 1989, reaching 65 landowners. The principal Extension objective for the shortcourse was for participants to develop a strategies planning approach to ranch management. After completing the course, all participants indicated plans to make changes in their operations, ranging from fishing developments and hunting leases to converting hayland to grazed pasture and retaining ownership of cattle in commercial feedlots. Past graduates of the shortcourse have successfully achieved 5-year economic goals within two years and from annual losses exceeding $100,000 to net gains of $100,000 within three years.

The University of Arkansas-Pine Bluff reports thirty-one (31) percent of the 506 nonindustrial private forest landowners (NIPFLO's) used preharvest regeneration planning on 15,450 acres that will net a return of $305,760 resulting from reduced regeneration costs, higher regeneration success and an increase in production through the life of the stand. The Acres of Wildlife program, jointly sponsored with the Arkansas Game and Fish Commission, had 4,858 Arkansas landowners improving wildlife habitat on 1,639,332 acres in 1988. This represents an increase of 694 landowners and 181,332 acres over the 1987 program year. Landowners plant trees, shrubs, and wildlife food plots as the primary methods of habitat improvement. Aquaculture (catfish) production technology was transferred to 163 catfish producers through area producer workshops. Fifty-two (52) agents attended in-service training to be updated on new production technology. A southeast area tour was provided to 47 bankers to familiarize them with the costs and returns of typical catfish production operations, backgrounding them in order to provide increased financial support to producers.

Other significant State activities addressing conservation and management of natural resources include continuing education opportunities for state and federal agency and Extension Staff such as the 4th Annual National Wildlife Damage Conference (Wisconsin) and the Riparian Classification System Workshop Series (California, Nevada, Oregon).

Landowner education activities included the cooperative Neighbor-to-Neighbor Conservation Farming Demonstration Project (Nebraska) and several Total Ranch Management Shortcourses (California, Wyoming, Oklahoma and Texas). In North Carolina, Extension assistance provided to a lumbermill dealing with a feasibility study to convert present oil boilers to wood fired boilers resulted in projected annual oil cost savings of over $300,000. Extension publications such as "Extension in Action: Conserving and Managing Our Nation's Forest Resources" (Florida) have been prepared for the benefit of the general public.

FAMILY AND ECONOMIC WELL-BEING

American families in unprecedented numbers are feeling the impact of eroding purchasing power and changing employment opportunities. There are more single parent families, one child in every five is being raised in poverty, and child abuse and neglect are a national concern. Empowering families with the skills to be self-reliant, financially secure, contributing members of society is the educational goal of Extension's Family and Economic Well-Being National Initiative.

Through audience-targeted Extension education on family financial instability, thousands of low-and middle-income families (more than 400,000 in 14 States reporting impacts in 1989) gained the knowledge and analytical skills essential to managing money and making wise consumer decisions. On the average, eight out of 10 families set up a budget to monitor spending, two out of three began saving money regularly, and one out of four was able to significantly reduce consumer debt.

The loss of a farm or a job, dealing with death or divorce, or balancing work and family are putting stress overload on many families. Twenty States offering Family Disruption and Dislocation Programming reported 238,096 people participated in programs to help them develop the competence and confidence to effectively deal with the changes in their lives.

States have addressed the issue of dependent elderly through educating caregivers and conducting dependent elderly programs that encourage independent choices for the elderly.

Efforts in retirement planning education in New York reached 3,200 persons through workshops, and 40,500 more through newsletter series. One county's evaluation of 237 program participants showed 85 percent were stimulated to make financial plans for retirement.

Tuskegee University reports that 10,505 traceable contacts were made during FY'88. Most of these contacts were in workshops, home visits and office or telephone consultations. The remainder was through mass mailing of newsletters or other literature. Three thousand three hundred sixty five contacts were made with adolescents participating in large and small group meetings designed to strengthen problem solving/decision making and social skills. Teen's growth is evident in the kinds of questions they ask and how they respond to one another. Continued increases in addendace also suggest that teens are responding well to the program.

Eleven out of 67 counties in Florida trained volunteer budget counselors. In one county, 15 volunteers trained by Extension, reached 58 families with severe money problems. The 34 families who provided evaluation data said they were able to cut the number of creditors about 20 percent. Nearly two-thirds of these families began contributing regularly to a savings account.

Seven Wisconsin communities completed community child care needs assessments. Follow-up actions have included establishment of after school day care programs, Phone-a-Friend programs, and educational sessions for youth. Outreach workers in Iowa have developed helping relationships with 780 rural and farm households. Help received was for employment and job training, starting a new business, and farm financial management. Evaluations showed clientele families do take action based on information provided by the outreach worker.

The Volunteer Information Provider Program (VIPP), developed in Missouri, was partially funded with an Administration on Aging grant and piloted in 20 States. Reports average of 16 caregivers of the elderly or a total of 7,008 caregivers. Volunteers contributed 44,637 hours to the program. For each dollar of grant monies received, $2.30 was returned to communities through in-kind contributions.

WEDNESDAY, MARCH 7, 1990.

NATIONAL AGRICULTURAL LIBRARY

WITNESSES

CHARLES E. HESS, ASSISTANT SECRETARY FOR SCIENCE AND EDUCATION

JOSEPH H. HOWARD, DIRECTOR, NATIONAL AGRICULTURAL LIBRARY

MARIA G. PISA, ASSISTANT DIRECTOR

STEPHEN B. DEWHURST, BUDGET OFFICER, DEPARTMENT OF AGRICULTURE

Mr. AKAKA [presiding]. May we have the National Agricultural Library panel, please?

Mr. Howard, we're glad to have you here, and Maria, also, and we look forward to your testimony. We'll put your testimony in its entirety in the record, and you may proceed at will.

Mr. HOWARD. Fine, I'll be glad to summarize that for you, Sir. I would like to recognize, as you have, Maria Pisa, who is the new Assistant Director at the National Agricultural Library.

NATIONAL AGRICULTURAL INITIATIVES

Mr. HOWARD. Mr. Chairman and members of the subcommittee, it is a pleasure for me to appear before you to explain the proposed fiscal year 1991 budget for the National Agricultural Library.

NAL is at the apex of the effort of the nation's agricultural libraries to meet the needs of farmers, agriculture businesses, researchers and others for the most up to date information on agriculture that is available.

With more world attention focused on agricultural issues like pesticide use and soil and water depletion and more countries competing for agricultural export markets, the information maintained by NAL has become increasingly more vital to the survival and well being of U.S. agriculture.

NAL is fast gaining a reputation throughout the international agricultural community as the most complete source of agricultural information available in the world.

The Library is also recognized as the world leader in the application of new information management technologies as applied to agriculture.

Where our resources allow, we try to respond to the increasing number of requests we receive from our international friends.

NAL also plays an important international role in helping keep the United States ahead of other countries in what has become an intensely competitive agricultural research area.

With so many countries challenging the United States for the title of agricultural research leader, NAL's network of international contacts, developed through the cooperative exchange of information, allows U.S. scientists to keep up on the latest development in agricultural research.

The increases in funding that NAL has received in recent years has enabled us to far exceed the expectations of all of our users in providing information services.

We at the Library take pride in being able to gain maximum benefit from these budget processes. NAL does this through a combination of outreach to agricultural libraries in the United States, through cooperation with the important network of U.S. land grant university libraries, and through the pursuit of advanced information management technologies, such as computerized indexing and full text digitizing.

To continue the level of service USDA, the Nation, and the world has come to depend upon from NAL, we are requesting a total of $15.773 million in fiscal year 1991 funds.

LIBRARY MATERIALS

This figure reflects a $1.1 million increase over the 1990 funding level, an increase made necessary by the rising cost of library materials and by our desire to continue to improve the vital services we provide to U.S. and world agriculture.

Specifically, our request includes an increase of $906,000 for library materials, $250,000 for networking, and $321,000 to cover the increased cost of NAL salaries connected with the 1989 and 1991 pay raises.

NETWORKING

I will now address the $250,000 increase requested for networking funds. As the premiere agricultural library in the world, NAL is looked to by its users to coordinate services available from agricultural libraries throughout the United States.

Networking with these libraries is key to avoiding duplication of efforts, to sharing special library collections, to maintaining an updated National directory of agricultural information.

I believe NAL has taken the first step in rising to this challenge through its involvement with the recently formed United States Agricultural Information Network, or USAIN.

USAIN is made up of representatives from agricultural libraries across the country. NAL has been instrumental in helping to establish USAIN as a group that is committed to strengthening agricultural libraries and information services and to promote cooperation and communication among those groups.

Equally as important as USAIN is the network for sharing information that NAL has developed with the land grant university libraries.

Cooperative programs between NAL and land grant universities have resulted in unique computer systems, like text digitizing, which improve the access researchers have to agricultural information.

PAY COSTS

Finally, I would like to point out that we are requesting an increase of $321,000 to help partially defray the cost of pay raises for NAL employees in 1989 and 1991.

That U.S. agriculture is such a world leader in production may be related in no small way to the fact that NAL is a world leader in managing agricultural information.

Even in agriculture, information is power. Funding at the level we have requested for fiscal year 1991 will ensure that NAL retains its world distinction and will help us keep our momentum as we move ahead in addressing the growing information needs of U.S. agriculture.

Thank you very much, and I will be happy to answer questions that you might have.

[Biographical sketch appears on page 609. Mr. Howard's written statement appears on pages 610 through 615. The National Agricultural Library explanatory notes appear on pages 616 through 633.]

ELECTRONIC LIBRARY

Mr. AKAKA. Thank you very much, Mr. Howard. We're certainly happy to have you and Maria here. There was just one thing, before I relinquish the seat back to the Chairman, that I'd like to ask you, and that is you mentioned an electronic library.

Mr. HOWARD. Yes.

Mr. AKAKA. Can you explain to me what an electronic library is?

Mr. HOWARD. Another term for this might be a library without walls. So, electronically, you have the technology available for communicating between libraries whereby we share information and network, and it will no longer—now, this is not true yet—but someday we will be able to make progress on this, and we are making progress, someday you will be able to say it doesn't matter where something is as long as we know where it is and how we can get to it fast.

So the new technologies are helping us be able to communicate and cooperate much more effectively than we have in the past.

Mr. AKAKA. Thank you for that response.

Mrs. Smith?

NETWORKING

Mrs. SMITH. Thank you.

I want to say how much we appreciate having both of you here. I thought you gave a very fine report and a very concise report.

UNITED STATES AGRICULTURAL INFORMATION NETWORK

You commented in your testimony about the recently formed USAIN and your belief that this new organization is important for future information sharing between agricultural libraries.

Would you briefly explain to the Committee how this organization functions and what libraries are involved in the program? Has it been successful thus far?

Mr. HOWARD. In 1988, the National Agricultural Library was instrumental in the formation of a agricultural libraries and information network, now called the United States Agricultural Information Network—USAIN. The primary goal of this network is to provide a forum for the discussion of agricultural information issues. Through the network, NAL, land-grant university libraries, and special libraries will improve access to agricultural information. The objectives of USAIN are to improve telecommunications and networking among agricultural information libraries, provide a forum to actively participate in legislation and governmental affairs affecting library operations, seek out new technologies for improved library processes, and form interest groups on specific library topics to improve operational activities.

Since its inception, 135 individual members and 16 institutional members have joined USAIN, representing a wide cross section of land-grant, federal and special libraries. This includes 16 land-grant university libraries, 9 agribusiness libraries, and the National Agricultural Library.

USAIN has formalized its bylaws, continued work on the Text Digitization Program, held meetings on agricultural information issues, provided testimony on library operations before the House Subcommittee on Agriculture, and submitted an article for publication in *Special Libraries*, a quarterly journal.

Mrs. SMITH. I'm wondering, is this increase of $1.1 million in the President's budget going to be adequate considering your great expansion in the international field?

Mr. HOWARD. This is no secret to you, but libraries really can use lots and lots of money.

Mrs. SMITH. Let me hasten to say we all can, and we don't have it.

Mr. HOWARD. I think what we are trying to do now, considering the fact that there is not a lot of new money available, we're trying to ask for the bare minimum, and we'll try to do more with networking with people so that the Nation can respond and share. Nationally we will be able to save money.

Mrs. SMITH. I was very much impressed, and I'm glad that you gave us a bare budget, because we're having enough trouble now trying to stretch our money around. Thank you very much for coming.

I have no more questions, Mr. Chairman.

MARKETING COMMODITIES

Mr. WHITTEN [resuming chair]. Thank you very much.

I was called out. I'd like to call your attention to the Agricultural Yearbook for 1988. I have not had a chance to read it. The book was on marketing, but the Department prohibits the use of its best marketing tool—the Commodity Credit Corporation. It can sell commodities for what the traffic will bear. So I wonder how they talk about marketing when you won't use the Commodity Credit Corporation. For 48 years CCC sold in world trade for what the market would bear. You discontinued using that approach some years ago. Now you're writing a book on marketing. We've got folks at high levels going around trying to get other countries to let our commodities in, and they won't do it, and they're not going to do it.

Every restriction on our products is there for the purpose of keeping our stuff out. Any idea you've got, I hope you'll call it to the attention of this Committee. Otherwise, we'll have to restrict the issuing of the Yearbook until we have some idea of what the subject is going to be.

We know that your office isn't responsible. There are others involved, but this Committee is going to expect to have to be counseled with before we provide money for it.

Mr. HOWARD. We participate in the group that decides what the book will address.

Mr. WHITTEN. Participation is a word that has several meanings. What does that mean?

Mr. HOWARD. That means that when we go back we will let them know what you said.

Mr. WHITTEN. I can't ask for anything better than that, but in case you forget, I'm going to write it in this record.

LISTING OF INFORMATION CENTERS

Mr. WHITTEN. Mr. Howard, we know that during the past couple of years one of your main objectives has been the establishment of specialized information centers. Please list all of the specific centers, its general purpose, and the resources provided to each in terms of manpower and funds.

Mr. HOWARD. I would be pleased to provide the information.

[The information follows:]

Resources Provided to NAL Information Centers - FY 1990

Information Center	General Purpose	Resources From: Appropriation	Resources From: Reimbursement	Total Direct Resources	Related Support 1/	Staff Years
Agricultural Trade & Marketing	Provides information that aids U.S. agribusiness in remaining competitive in the international marketplace.	$55,230 2/	-0-	$55,230	$185,509	1
Alternative Farming Systems	Offers ideas to agriculturalists interested in lessening the impact of farming on the environment.	39,329 2/	$100,000	$139,329	127,238	2.5
Animal Welfare	A focal point for those interested in obtaining information on domestic and laboratory animal welfare.	736,770	-0-	736,770	-0-	4.5
Aquaculture	Assists those interested in aquaculture in establishing profitable operations.	58,230 2/	77,914	136,144	125,936	2.5
Biotechnology	Storehouse for current knowledge on genetic engineering, and other scientific data related to farm animals and plants.	98,800	-0-	98,800	236,121	.25
Critical Agricultural Materials	Offers information on new crops and on new uses for old crops.	2,758 2/	-0-	2,758	72,147	
Family	Addresses the strength, well-being, economics and social environment of the U.S. family.	916 2/	-0-	916	185,716	
Fiber & Textile	Responds to questions on the processing and end-uses of natural and man-made fibers, textiles and apparel.	916 2/	-0-	916	64,118	
Food & Nutrition	Maintains and monitors current data on healthy diet and nutrition for all sectors of U.S. society.	424,600	110,000	534,600	129,758	1.25
Food Irradiation	Provides current scientific data on the use of this controversial technology.	916 2/	-0-	916	59,022	
Horticulture	Covers economic botany, fruits, vegetables, herbs, bonsai, floriculture, and possible uses of wild plants.	2,190 2/	-0-	2,190	187,021	
Rural	Provides information and referral services to local governments and communities to revitalize rural communities.	279,500 3/	-0-	279,500	179,267	2.6
Technology Transfer	Assists in getting research results into the hands of those who can put it to practical use.	223,250	-0-	223,250	69,507	1
Youth	Supports youth development professionals in meeting the needs of America's youth.	-0-	100,000	100,000	116,168	6.5
Water Quality	Monitors and maintains information on farming's effects on U.S. water supplies.	247,000	-0-	$247,000	$1,797	1
TOTAL		$2,170,405	$387,914	$2,558,319	$1,749,559	19.1

1/ Funding for general NAL activities related to the specific information center.
2/ Funding redirected to support the information center.
3/ Includes $56,000 redirected for coordinator of information center.

USAGE OF INFORMATION CENTERS

Mr. WHITTEN. Do you have any information regarding the usage of each of these centers? In particular, who are the clients that use the centers and how many requests or types of use have you had per center?

Mr. HOWARD. The usage of each information center has increased over the years. This is due to increased public interest in agricultural issues, expanded research needs, and support of the growing industries. From fiscal years 1988 to 1989, the Information Centers Branch experienced a 5 percent increase in number of requests. Based on the recent volume of inquiries received at National Agricultural Library, we expect requests will increase 25 percent in fiscal years 1990 and 1991.

All centers provide information and referral services to the public and private sectors on demand; many also serve specialized audiences. The Rural Information center, for example, frequently provides information and referral services to local government officials, businesses, community organizations, and rural citizens working to maintain the vitality of America's rural areas. The Food and Nutrition Information Center provides information to nutritionists, school food services and teachers, and consumers. The Aquaculture Information Center primarily supports information needs of the general public, aquaculturists, and private industry.

The National Agricultural Library, at this time, does not keep detailed user statistics broken out by specific audience. In general, over 81 percent of the total number of requests processed by information centers in fiscal year 1989 were from persons outside of USDA—namely educators, consumers, farmers, and other public and private sector personnel.

During fiscal year 1989, the National Agricultural Library's Information Centers handled 14,627 reference requests, which included 3,561 computerized literature searches, and distributed 14,556 publications.

However, these numbers are over and above other requests for information and/or material from other organizational entities of the National Agricultural Library, where the subject also relates to a specialized information center. For instance, in 1989, 239,009 document requests were filled; 127,404 other references requests were answered, 116,129 automated searches were conducted, 159,620 requests were received for lending material, and an additional 95,708 documents were delivered to USDA scientists through the National Agricultural Library's regional document delivery and interlibrary loan program.

I would be glad to provide for the record the information on statistics maintained by specific information centers.

[The information follows:]

Information center	Requests	Publications distributed	Computer searches
Agriculture trade and marketing	1,457	5,293	645
Alternative farming systems	823	5,194	99
Animal welfare	895	17,156	143
Aquaculture	2 206	20,176	712

Information center	Requests	Publications distributed	Computer searches
Biotechnolgy	483	7,772	86
Critical agricutural materials	80	300	20
Family information	140	1,900	110
Fiber and textile	30	30	40
Food and nutrition	7,051	37,645	1,103
Food irradiation	80	150	10
Horticulture	135	1,086	34
Rural	1,047	35,854	389
Youth development	200	15,000	170
Total	14,627	147,556	3,561

WATER QUALITY INFORMATION CENTER

Mr. WHITTEN. Last year, Mr. Howard, you indicated that during fiscal year 1990, you propose to establish a Water Quality Information Center. Has, in fact, that been established, and what resources are devoted to it?

Mr. HOWARD. The Water Quality Information Center has been established, and $247,000 is the level of resources available in FY 1990 along with 1 FTE staff year.

WATER QUALITY INITIATIVE

Mr. WHITTEN. The President's Budget proposes significant increases concerning water quality initiatives. Is the National Agricultural Library in any way tied into this initiative?

Mr. HOWARD. The National Agricultural Library is a participant in the President's water quality initiative. A Library representative serves on the Department of Agriculture's Working Group on Water Quality and the Library has established a Water Quality Information Center to provide additional emphasis to the program. Intensive information support in key areas of this initiative will be provided for both the nation's and public interests in water quality. Availability of a well coordinated information source will be important to the success of the research and education components of the initiative.

YOUTH INFORMATION CENTER

Mr. WHITTEN. During fiscal year 1989 you established the Youth Information Center in conjunction with the Extension Service. One of the Department's initiatives this year is an activity called "Youth-at-Risk" to be sponsored by the Extension Service. Is your center in any way related to the Extension Service's initiative and please describe its relationship?

Mr. HOWARD. The Youth Information Center works closely with Extension Service/4-H professionals to include publications in the National Agricultural Library collection which support "Youth-at-Risk" programs. More than a thousand documents including teaching materials, journal articles, and research publications are currently in this growing collection. Publications outlined in the reports of the national Youth-at-Risk Task Force or recommended by Extension Service/4-H staff working with at-risk youth across the nation receive the highest priority for the Center's collection. The Center participated in one of the regional Youth-at-Risk Task Forces, meets regularly with the Extension Service/4-H staff, and works closely with the National Association of Extension 4-H Agents.

ADVANCED TECHNOLOGIES

Mr. WHITTEN. Again, last year in testimony before the Committee, Mr. Howard, you indicated that one of the thrusts of the NAL program was the early application of advanced technologies. How are you able to promote early application and have you had any successes in your opinion to establish this?

Mr. HOWARD. Early application of advanced technologies is a complex process. The identification and assessment of new technologies requires a highly skilled technical staff with a thorough understanding of the mission of the library, and great creativity in terms of identifying new means for providing improved library services.

Once an appropriate technology has been identified, we find a cooperator who is interested in pursuing the project with us. This provides for a sharing of the expenses and involvement of addition expertise. NAL works closely with the land-grant community in the definition and implementation of many of these projects. The National Agricultural Text Digitizing Project is one which owes its success to the participation of the land-grant library community.

An adjunct project is now in place which links NAL and North Carolina State University through the National Science Foundation's Internet, in order to determine the feasibility of providing faster document delivery to the agricultural community through the transmission of digitized images over the Internet.

Another successful project is the completion of a multi-media CD-ROM which contains textual, graphic, pictorial and audio information for delivery of Extension Service materials throughout the U.S. This project, which will include distribution of over 200 CD-ROMs, is being done in cooperation with the Cooperative Extension Services of Virginia and Minnesota.

CAPITAL DEVELOPMENT REQUIREMENTS

Mr. WHITTEN. Part of the increase provided for fiscal year 1990 was to prepare a feasibility study on capital requirements necessary for the National Agricultural Library building and its fixed equipment. For the record, please provide a table showing the budget request you prepared for the Secretary, the Department's recommendation to OMB, and the OMB allowance.

Mr. HOWARD. I would be glad to provide the information for the record.

[The information follows:]

NAL'S REQUEST FOR CAPITAL IMPROVEMENTS—FY 1990

[Dollars in thousands]

Capital development	Agency	Department	OMB
Compact shelving	$325	0	0
Fire detail and suppression study	50	0	0
Humidity/temperature control study	25	0	0
Binding	250	$250	$250
Text digitization	250	0	0
Deacidification	100	0	0
Capital development study		125	125
Total	1,000	375	375

ANIMAL WELFARE INFORMATION CENTER

Mr. WHITTEN. The Animal Welfare Information Center has been an ongoing activity for several years—first funded under a reimbursable agreement from APHIS and now contained within the NAL funds. APHIS is still contemplating final release of its Animal Welfare Regulations and a portion of what the Animal Welfare Information Center would do would be to respond to activities related to these regulations. Since the APHIS regulations are still pending, what activity is generated from the Animal Welfare Information Center?

Mr. HOWARD. Parts 1 and 2, Title 9 of the Code of Federal Regulations, which pertain to the Animal Welfare Rules and Regulations, were finalized and issued on August 31, 1989. Specifically, within Part 2, the Animal Welfare Information Center is responsible for providing information assistance to researchers on alternatives to experimental procedures that may cause more than momentary or slight pain or distress to animals, by conducting extensive literature searches. Researchers presenting protocols using animal models and involving painful procedures are required by their Institutional Animal Care and Use Committee—IACUC—to contact the center as part of the review procedure. The use of the Center has increased two-fold.

The Animal Welfare Information Center has used the subject areas as defined by Congress in the 1985 Improved Standards for Laboratory Animals Act to develop information center activities, programs and projects. Since its inception, the Center has produced a variety of information resources. To date 30 information products have been produced and over 35,000 have been distributed. Technical assistance is provided to all individuals of institutions, organizations, and associations contacting the center for information regarding laboratory animals. Over 5,000 reference requests have been responded since fiscal year 1987.

The collection of print and non-print media in the National Agricultural Library containing information on laboratory animals continues to be enhanced by careful selection of information media by the Center. To provide rapid access to information, an Animal Welfare conference module has been added to the National Agricultural Library electronic bulletin board system that allows patrons quick access to staff and publications.

Staff members actively participate in outreach activities. An animal welfare exhibit was developed and becomes an integral component of display at a variety of scientific and professional meetings each year. This exhibit can be borrowed.

To assist registered research facilities with compliance under the Animal Welfare Act, the Center produced a videotape in 1989 entitled "Resources Today for the Research for Tomorrow" detailing the Center activities and services. Approximately 1300 tapes were distributed to all research facilities registered with APHIS as well as state and federal research institutions.

The Center has cooperative associations with the following institutions: Johns Hopkins University Center for Alternatives to Animal Testing, University of Illinois, University of Maryland, Scientests Center for Animal Welfare, Institute of Laboratory Animal Resources, Texas Tech University Health Sciences Center, Animal Behavior Society, and the Princeton Scientific Publishing Company, Inc.

The Animal Welfare Information Center has established a close reciprocal working relationship with APHIS. Other users include other USDA Agencies, Environmental Protection Agency, Department of Transportation, Health and Human Services, and the Food and Drug Administration. With the escalation of concern over issues involving the use of animals in research and agriculture, the Center will continue to be an important, objective, and responsive source of information.

ANIMAL WELFARE GRANTS

Mr. WHITTEN. Last year you indicaed that you had issued five informal grants related to the Center. Please explain what an informal grant is and describe these five grants.

Mr. HOWARD. The "informal" grant program the National Agricultural Library is referring to is a non-competitive process to seek out organizations that can develop information products addressing topics related to the proper care and use of laboratory animals.

I will provide a list of the five grants made in fiscal year 1988 for the record.

[The information follows:]

1. Scientists Center for Animal Welfare: Publication of the proceedings of their 1988 annual meeting entitled, *Science and Animals: Addressing Contemporary Issues.*
2. Texas Tech University Health Sciences Center: Production of an education videotape program entitled. *Alternatives in Animal Research.*
3. Princeton Scientific Publishing Co., Inc.,: Production of two books: *Benchmarks: Alternative Methods in Toxicology,* and the *A Predictive Model for Estimating Rat Oral LD50 Values.*
4. National Academy of Science, Institute of Laboratory Animal Resources: Production and publication of guidelines for the management of laboratory rodents.
5. National Academy of Science, Institute of Laboratory Animal Resources: Production and publication of guidelines for the care and management of laboratory dogs.

OBJECT CLASS—OTHER SERVICES

Mr. WHITTEN. For the record, please provide a breakdown of object class 25, other services.

Mr. HOWARD. I would be pleased to provide the information.

[The information follows:]

OTHER SERVICES

	Fiscal year—		
	1989	1990	1991
Cooperative agreements with state institutions	$516,733	$620,000	$680,000
Other cooperative agreements	347,253	450,000	500,000
Contractual services	1,189,529	1,300,000	1,400,000
ARS management services	375,210	400,000	400,000
Repairs/maintenance equipment	111,914	120,000	130,000
Reparis/maintenance facility	142,634	150,000	150,000
Oneline retrieval service	511,267	570,000	630,000
Computer center services	22,905	25,000	25,000
Data processing services	3,282	3,500	4,000
Training tuition fees	54,095	60,000	60,000
National Finance Center services	140,000	150,000	150,000
Telephone equipment	11,852	12,000	15,000
Video and film center services	5,030	5,000	5,000
Miscellaneous services	80,120	96,064	105,367
Total	3,511,833	3,961,564	4,254,367

LIST OF FACILITY NEEDS

Mr. **Whitten**. Please provide for the record a list of facility needs that have not been met yet, and indicate the proposed funding year you expect to accomplish the replacement or construction activity.

Mr. **Howard**. For the record, I will provide a list of facility improvements.

[The information follows:]

Fiscal year	Item
1990	Facility condition study
1991	Improve short-term patron parking area
1992	New roof on tower
Future	Replace book lift
Future	Point up and repair exterior of building
Future	Energy retrofit windows and doors
Future	Expand parking lots
Future	Fire suppression system
Future	Replace passenger elevators
Future	Compact shelving

LIBRARY MATERIALS

Mr. **Whitten**. Your largest increase proposed for fiscal year 1991 is for library materials. You have indicated that the cost of foreign titles has increased by approximately 192 percent in the past ten years. How many foreign titles did you purchase during fiscal year 1989? Are all of these translated into English?

Mr. **Howard**. In fiscal year 1989, the National Agricultural Library purchased 2,652 foreign journals, of which 1,568 were in English.

Publishing in the Scientific-Technical-Medical—STM—market has become dominated by European publishers. During the post-World War II years, while most American STM publishers were oriented toward text book publishing, the European publishers pursued world market possibilities, shifting to English as the language of publication. As scientific disciplines become increasingly specialized, the frequent branching off of new specialty journals has tended to favor the established publishers. Prices of established, high-demand scientific journals have escalated alarmingly for many reasons, including the following: the market dominance of a few large publishers; foreign currency exchange rates disadvantageous to U.S. libraries; competition among scientists to publish for promotion, tenure and grants; growth in number of volumes and pages of successful journals in order to publish information in a timely way; high front-end costs of starting new journals, so that older ones subsidize new ventures; differential pricing whereby North American libraries are required to pay more than European subscribers, or libraries must pay more than individual subscribers; and the increasing dominance of commercial publishers over not-for-profit societies. These reasons, collectively, are contributing to a crisis in the library community.

FOREIGN TITLE COST

Mr. WHITTEN. What is the total cost of purchase for foreign titles?

Mr. HOWARD. In fiscal year 1989, the cost to the National Agricultural Library for foreign titles was $530,809.

TRANSLATION TO FOREIGN LANGUAGE

Mr. WHITTEN. Does the NAL program translate any publications from English into a foreign language?

Mr. HOWARD. The National Agricultural Library's Translations Program does not translate materials from English into any foreign language.

USAGE OF THE NATIONAL AGRICULTURAL LIBRARY

Mr. WHITTEN. Are there any records available which would show the increased usage of the National Agricultural Library resources in the past five years? Please provide them for the record.

Mr. HOWARD. I would be pleased to provide you with the information.

[The information follows:]

USAGE INDICATORS OF NATIONAL AGRICULTURAL LIBRARY

	1987 actual	1988 actual	1989 actual	1990 estimate	1991 estimate
Filled document requests	176,402	195,352	239,009	243,353	249,457
Reference inquiries answered	23,579	27,156	42,031	44,133	46,340
Automated searched condensed	21,832	23,396	23,756	24,945	26,192
Current awareness searches	101,572	98,110	92,373	101,610	111,771
Lending requests	152,552	171,889	159,620	169,601	179,777
Regional Doc. Delivery to USDA	74,984	79,193	76,682	80,516	84,542
Interlibrary borrowing for USDA	20,388	21,948	19,026	20,935	23,742

USAGE INDICATORS OF NATIONAL AGRICULTURAL LIBRARY—Continued

	1987 actual	1988 actual	1989 actual	1990 estimate	1991 estimate
Information center reference requests	12,000	14,270	14,627	18,750	23,500
Other reference requests	11,579	13,802	27,404	25,383	22,840
Total indicators	594,888	645,116	694,548	729,226	778,161
Percentage increase over 1987		+8.4	+16.8	+22.6	+30.8

TEXT DIGITIZING PROJECT

Mr. **Whitten**. The NAL is currently working on a joint text digitizing project with 44 land-grant institutions. This is a two-year project to digitize library materials. What funds are land-grant institutions providing towards this project? The first CD-RON entitled "Aquaculture I" was produced and distributed to the libraries for evaluation. Is the evaluation process complete and, if so, what are the general comments related to the new process?

Mr. **Howard**. Each participating land-grant institutions has provided $3,000 per year during the two-year project. In addition, each institution purchased a microcomputer with which to search the CD-ROM products from the project at a cost of approximately $3,000.

The evaluation of the Aquaculture I disc has not yet been completed. However, a number of issues have been identified which are of importance to the future use of CD-ROM as a delivery mechanism. A major criticism of the product was the complex nature of the user interface of the retrieval package, and its slow response time when doing proximity textual searches. A more positive assessment was the appreciation for the amount of unique material which could be delivered on a CD-ROM, the ability to deliver high resolution graphics albeit only to specialized work stations, and the ability to print a high resolution paper copy as good as the original.

PRESERVATION OF LIBRARY MATERIALS

Mr. **Whitten**. You have indicated because of deterioration within the Library materials, approximalely 28 percent of the NAL collecton needs to be transferred to another medium such as electronic or film before it can be used anymore. What is the status of the preservation project and what will be the total cost of preserving approximately 30 percent of the NAL materials?

Mr. **Howard**. The National Agricultural Library has completed an internal study for ensuring access to scientific and technical material in the collection that is deteriorating. This study indicated that there was a cause for concern regarding the condition of materials in the collection and the National Agricultural Library's ability to provide access to this material as a consequences.

In today's dollars, the cost estimate of preserving 30 percent of the National Agricultural Library collection based on a collection of 2,000,000 volumes at an average cost of about $80 per volume would be about $48,000,000.

Given the high cost of preservation, the National Agricultural Library expects to work with other libraries, through a network, to coordinate the preservation plans, avoiding duplication, and some of the cost of preservation.

ARKANSAS LAW LIBRARY

Mr. WHITTEN. The Arkansas Law Center has been funded for three years. How many reports are produced by the Center to date?

Mr. HOWARD. The National Agricultural Library has received two written reports of work since initiation of the grant. The most recent accomplishments reports shows that 40 research projects have been published or are currently being published, 11 speeches, talks, and other presentations have been given, and six more are scheduled for the remainder of 1990.

NATIONAL AGRICULTURAL LIBRARY/ARKANSAS LAW LIBRARY RELATIONSHIP

Mr. WHITTEN. What relationship does the NAL program have to the Arkansas Law Center?

Mr. HOWARD. The Robert A. Leflar Law Center, University of Arkansas received funding from the National Agricultural Library appropriation for the establishment and operation of the National Center for Agricultural Law and Information. The funding has been administered as a grant.

The Center cooperates with the National Agricultural Library on a formal and informal basis. The Center provides research assistance and information support services which can be utilized by the agricultural and legal community as well as those responsible for administrative and legislative decisions. The Center also provides a centralized system for collecting and indexing agricultural law and policy materials, and for maintaining current bibliographic resources on specific agricultural law and policy questions.

The National Agricultural Library assists the Center in providing long-range planning with particular emphasis on using new technology for the collecton and dissemination of legal information; making recommendations on structuring, staffing, training, and operating Center information programs, providing advice on networks that would be useful in obtaining and disseminating information on agricultural law; assistang as needed with recommendations on equipment and materials purchases, document delivery, and other functions; suggesting nationally compatible cataloging and indexing methods; and making arrangments to have the Center's records added to the AGRICOLA databases, thus ensuring national and international availability.

ARKANSAS LAW LIBRARY REPORTS

Mr. WHITTEN. How many requests has NAL had for reports prepared by the Law Center?

Mr. HOWARD. In a recent contact with personnel at the Law Center they indicated that they have received between 50 and 100 calls requesting information since October, 1989. In addition they have responded to many more questions emanating from speeches, talks, and other outreach presentations.

Presently, it is not possible to track the usage of particular materials in the National Agricultural Library collection or particular reference questions which may be answered through the use of these materials. However, bibliographic access to these reports is made available through the National Agricultural Library. Copies of the reports produced by the National Center for Agricultural Law Research and Information are added to the National Agricultural Library collections after cataloging records are created using the OCLC online cataloging system and become part of the AGRICOLA database. This database, which is produced by the National Agricultural Library, contains 2.7 million literature citations, and is an essential resource for obtaining access to agricultural information. Records in this system are searched and used by thousands of other libraries for the purpose of acquisitions, cataloging, reference and interlibrary loan.

PAGES OF LIBRARY MATERIAL PRESERVED

Mr. WHITTEN. Under your column on page 10g–3, you have listed the estimated productivity of NAL activities. The number of pages preserved jumped three-fold from fiscal year 1989 to fiscal year 1990. Please explain this significant increase.

Mr. HOWARD. This increase of 4,212,000 pages preserved is the estimate resulting from the increase in funding in FY 1990 for binding activities. Binding is one viable option which the library can initiate to preserve and protect the national collection.

Mr. WHITTEN. Are there further questions? We appreciate your appearance.

Mr. HOWARD. Thank you.

Biographical Sketch
MARIA G. PISA

Maria G. Pisa is the new Assistant Director of the National Agricultural Library (NAL). Prior to assuming her present position, Ms. Pisa held progressively responsible positions at the Library including her most recent service as Assistant to the Chief of the Public Services Division of NAL and as Acting Head of its Reference and User Services Branch. Among her accomplishments in the Public Services Division was the co-development of NAL's electronic bulletin board system, ALF (Agricultural Library Forum). As Leader, Special Services and Communications, Education and Program Staff from 1984-1987, she served as editor of the Library's newsletter, Agricultural Libraries Information Notes (ALIN), as well as a variety of other publications and was responsible for coordinating many of the Library's outreach programs. She also served as a Reference Librarian in both Beltsville, Maryland and Washington, D.C. from 1981-1984. Ms. Pisa came to NAL in January 1981, from the USDA Statistical Reporting Service where she had worked as a technical information specialist since 1978. She earned her Master of Library Science from Catholic University in 1978, and a Bachelor of Science from Boston University in 1974. Before entering the library profession, she taught high school English. Ms. Pisa has been the author, coauthor, or editor of various publications and bibliographies and is a member of several professional societies including the American Library Association.

National Agricultural Library

Statement of Mr. Joseph H. Howard, Director, National Agricultural Library, before the House Subcommittee on Rural Development, Agriculture and Related Agencies.

Mr. Chairman and members of the Subcommittee, it is a pleasure for me to appear before you today to explain the proposed fiscal year 1991 budget for the National Agricultural Library (NAL).

I would like to start by giving a little background on the library.

With the Library of Congress and the National Library of Medicine, the National Agricultural Library is one of three national libraries of the United States.

NAL is at the apex of the effort of the nation's agricultural libraries to meet the needs of farmers, agribusinesses, researchers and others for the most up-to-date information on agriculture that is available.

With more world attention focused on agricultural issues like pesticide use and soil and water depletion; and more countries competing for agricultural export markets, the information maintained by NAL has become increasingly more vital to the survival and well-being of U.S. agriculture.

And while the thrust of NAL's operations is in maintaining and providing agricultural information for users in the United States, in recent years our efforts have become more international in scope.

NAL is fast gaining a reputation throughout the international agricultural community as the most complete source of agricultural information available in the world. The library also is recognized as a world leader in the application of new information management technologies.

Where our resources allow, we try to respond to the increasing number of requests we receive from our international friends. That the number of requests for information is increasing, I feel, is testament to our success and growing reputation, as well as to the increased world concern over agricultural issues.

NAL also plays an important international role in helping to keep the United States ahead of other countries in what has become an intensely competitive agricultural research arena. With so many countries challenging the United States for the title of agricultural research leader, NAL's network of international contacts, developed through the cooperative exchange of information, allows U.S. scientists to keep up on the latest developments in agricultural research.

And while meeting the information needs of the national and international agricultural communities, NAL also serves as the primary information resource to the dozens of agencies and hundreds of researchers and scientists within the U.S. Department of Agriculture. I should mention that this responsibility alone takes up the major portion of our operating resources.

The increases in funding NAL has received in recent years has enabled us to far exceed the expectations of all of our users in providing information services. We at the library take pride in being able to gain maximum benefit from these budget increases.

NAL does this through a combination of outreach to agricultural libraries in the United States, through cooperation with the important network of U.S. land-grant universities and through the pursuit of advanced information management technologies such as computerized indexing and full-text digitizing.

To continue the level of service USDA, the nation and the world has come to depend on from NAL, we are requesting a total of $15,773,000 in fiscal year 1991 funds.

This figure reflects a $1.1 million increase over the 1990 funding level--an increase made necessary by the rising cost of library materials and by our desire to continue to improve the vital services we provide to U.S. and world agriculture.

Specifically, our request includes an increase of $906,000 for library materials, $250,000 for networking and $321,000 to cover the increased costs of NAL salaries connected with the 1989 and 1991 pay raises. I'll address these separately.

The heart and bones of a reference/research library like NAL are the materials it has on its shelves, in its reference files, in its computer databases. To be useful in critical agricultural research, this material must be current. Obtaining and maintaining library materials is expensive and becoming more so.

The ability of NAL to procure library materials has been eroded by the rising costs of books, periodicals and other materials. Overall prices for U.S. journal literature have increased by 171 percent since 1978. The cost of foreign literature has gone up nearly 200 percent during this time.

As a result of these spiraling costs, NAL has been forced to cancel subscriptions to many serial publications and curtail the purchasing of other library materials.

The publication of agricultural periodicals, manuals and books has burgeoned in recent years. New materials providing a wealth of agricultural information are constantly being released.

These limitations effect the quality of NAL services. For example, we risk missing announcements of key agricultural developments contained in journals we can no longer afford.

The requested increase will enable NAL to expand its procurement of information important to U.S. agriculture. This, in turn, will ensure that we maintain the high level of information services needed in order for U.S. agriculture to meet its commitment to feed the people of this nation and to remain competitive in the world.

I'll now address the $250,000 increase requested for networking funds.

As the premiere agricultural library in the world, NAL is looked to by its users to coordinate services available from agricultural libraries throughout the United States. Networking with these libraries is key to avoiding duplication of efforts, to sharing special library collections, to maintaining an up-to-date national directory of agricultural information. In general, networking makes for more efficient operation for all agricultural libraries and better serves those seeking information.

I believe NAL has taken the first step in rising to this challenge through its involvement with the recently-formed United States Agricultural Information Network, or USAIN.

USAIN is made up of representatives from agricultural libraries across the country. NAL has been instrumental in helping to establish USAIN as a group that is committed to strengthening agricultural libraries and information services and to promoting cooperation and communication among these groups.

Equally as important as USAIN is the network for sharing information that NAL has developed with land-grant university libraries. Cooperative programs between NAL and land-grant universities have resulted in unique computer systems, like text-digitizing, which improve the access researchers have to agricultural information.

The increased funding for networking, if approved, will allow NAL to continue to successfully coordinate agricultural information resources in the United States.

Finally, I would like to point out that we are requesting an increase of $321,000 to help partially defray the costs of pay raises for NAL employees in 1989 and 1991.

I don't think it is boasting to say that the National Agricultural Library is the foremost source of agricultural information in the world. The multitude of requests from around the globe we respond to each month supports this statement.

That U.S. agriculture is such a world leader in production may be related in no small way to the fact that NAL is a world leader in managing agricultural information. Even in agriculture, information is power.

Funding at the level we have requested for fiscal year 1991 will ensure that NAL retains this world distinction and will help us keep our momentum as we move ahead in addressing the growing information needs of U.S. agriculture.

Thank you. I would be happy to try to answer any questions you have.

NATIONAL AGRICULTURAL LIBRARY

Purpose Statement

The National Agricultural Library (NAL) had its mission outlined by the Organic Act of 1862, establishing the Department of Agriculture. The act, as amended, sets forth a mission, "to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture, rural development, aquaculture and human nutrition, in the most comprehensive and general sense of the word," and placed upon the Secretary the responsibility to "Procure and preserve all information concerning agriculture, rural development, aquaculture, and human nutrition, which he can obtain by means of books..."

The NAL serves as the Nation's chief agricultural information resource. It provides agricultural information products and services through traditional library functions and through modern electronic dissemination to agencies of the USDA, public and private organizations, and individuals. The NAL coordinates a national network of public and private libraries consisting of the land-grant colleges and universities, other state supported colleges and universities with agriculturally related programs, other public organizations, industry, and other private sector organizations. The NAL provides a leadership role in U.S. participation in international agricultural library and information systems and in efforts to promote worldwide availability of agricultural information.

The NAL has as its ultimate purpose facilitating access to and use of information about agriculture and related sciences by all those who need the information. In addition to providing traditional library services such as bibliographies, reference services and document delivery to agricultural scientists and researchers, NAL is expanding its role and serving a wider audience by using modern information dissemination technology to its fullest. While the library has concentrated its thrust towards agricultural researchers, the wider audience includes Federal, State and local administrators, and agricultural extension and education personnel as well as the farmer, the small businessman, public groups at all levels, and the general public.

With approximately 2.0 million volumes of printed material on agriculture and supporting scientific disciplines, NAL has one of the largest collections of its kind in the world. Both current and historical information is collected and organized for effective utilization by a wide range of users, and is cataloged or indexed in AGRICOLA, the NAL database of 2.7 million citations to agricultural publications. The NAL also provides input of U.S. publication records to AGRIS, the cooperative agricultural database of the Food and Agricultural Organization of the United Nations.

The basic operations of the National Agricultural Library are located in the NAL Building at Beltsville, Maryland. Specialized services are provided from a reference center in Washington, D.C. Service is provided from both these locations as well as 18 officially designated USDA field libraries in the States and 38 smaller USDA centers containing a total of approximately a quarter of a million volumes.

As of September 30, 1989, the NAL employment was 183 permanent full time and 27 other than permanent, of which 179 permanent full time and 27 other than permanent are located in Beltsville, while the rest are located in Washington, D.C.

NATIONAL AGRICULTURAL LIBRARY

Available Funds and Staff-Years

1989 Actual and Estimated, 1990 and 1991

	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
National Agricultural Library	$14,268,000	192	$14,676,000	182	$15,773,000	182
Obligations under other USDA appropriations:						
Agricultural Research Service:						
Subscriptions Costs	5,194	---	5,186	---	5,186	---
Evaluation of Text Digitizing	57,000	---	---	---	---	---
Current Awareness Literature Service	528,798	3	481,000	3	481,000	4
Space Costs	164,067	---	171,670	---	146,670	---
NAL/ARS Library Initiatives	60,000	1	18,000	---	18,000	---
Postage and Mail Service	20,210	---	10,000	---	10,000	---
Transformers/Chillers	140,000	---	---	---	---	---
Document Delivery	---	---	60,000	---	60,000	---
Translations	250	---	---	---		---
Coca Bibliographies	7,631	---	3,705	---	3,705	---
Agricultural Marketing Service:						
Space Costs	15,526	---	16,133	---	16,133	---
Current Awareness Literature Service	---	---	2,436	---	2,436	---
Animal and Plant Health Inspection Service:						
Current Awareness Literature Service	20,207	---	22,029	---	22,029	---
Translation Service	4,658	---	---	---	---	---
Cooperative State Research Ser						
Support for Aquaculture Inf.Ct	70,191	1	56,650	---	15,000	---
Postage and Mail Service	7,355	---	5,667	---	5,667	---
Space	19,118	---	19,798	---	19,798	---
National Biological Impact Assessment Program	12,000	---	3,579	---	3,579	---
Joint Council Reports Staff	11,320	---	22,265	---	22,265	---
Alternative Farming Info. Ct.	100,000	2	100,000	2	100,000	2
Extension Service:						
Current Awareness Literature Service	12,475	---	12,440	---	12,440	---
Youth 4-H Information Center	100,000	2	100,000	2	100,000	2
Pesticide Application Training	45,000	---	---	---	---	---
Farmers Home Administration	9,564	---	67,610	1	62,102	1
Detail - J.W. Parson						
Forest Service:						
Current Awareness Literature Service	7,481	---	7,839	---	7,839	---
Indexing Service	33,467	1	35,907	1	37,200	1
Postage/Fees	467	---	560	---	560	---
Food Safety and Inspection Ser						
Current Awareness Literature Service	3,649	---	3,735	---	3,735	---
Food Irradiation Database	6,000	---	---	---	---	---
Food and Nutrition Service:						
Lending Services	110,000	---	110,000	---	110,000	---
Upgrade Nutrition Education Guide	60,000	---	---	---	---	---
Human Nutrition Information Ser						
Current Awareness Literature Service	6,064	---	6,188	---	6,188	---

NATIONAL AGRICULTURAL LIBRARY

Available Funds and Staff-Years

1989 Actual and Estimated, 1990 and 1991

	1989 Actual		1990 Estimated		1991 Estimated	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Office of International Cooperation & Development:						
Aquaculture Support	18,907	---	---	---	---	---
Current Awareness Literature Service	2,928	---	---	---	---	---
Training	1,000	---	---	---	---	---
Office of Public Affairs:						
Special Collections	20,000	---	---	---	---	---
Soil Conservation Service:						
Current Awareness Literature Service	2,084	---	3,672	---	3,672	---
Miscellaneous Activities	---	---	30,731	---	101,569	---
Total Other USDA Appropriations	1,682,611	10	1,376,800	10	1,376,773	10
Total Agricultural Appropriations	15,950,611	202	16,052,800	192	17,149,773	192
Other Federal Funds						
Dept. of Commerce, NTIS						
Sale of Photocopies	---	---	23,000	---	23,000	---
Environmental Protection Agency						
Bibliographies	58,590	---	80,000	---	80,000	---
National Oceanic and Atmospheric Administration:						
Aquaculture	11,500	---	20,200	---	20,200	---
Other Federal Funds	70,090	---	123,200	---	123,200	---
Total, NAL	16,020,701	202	16,176,000	192	17,272,973	192

Full-Time Equivalent Staff-Years:	1989 Actual	1990 Estimated	1991 Estimated
Ceiling	202	192	192
Non-Ceiling	10	10	10
Total	212	202	202

UNITED STATES DEPARTMENT OF AGRICULTURE

NATIONAL AGRICULTURAL LIBRARY

PERMANENT POSITIONS BY GRADE AND STAFF-YEAR SUMMARY

1989 and Estimated 1990 and 1991

GRADE	1989 HEADQUARTERS	1990 HEADQUARTERS	1991 HEADQUARTERS
ES-5	1	1	1
GS/GM-15	4	4	4
GS/GM-14	4	4	4
GS-GM-13	18	18	18
GS-12	41	41	41
GS-11	21	21	21
GS-9	6	6	6
GS-8	3	3	3
GS-7	32	32	32
GS-6	33	33	33
GS-5	13	13	13
GS-4	8	8	8
GS-3	1	1	1
Total, Permanent Positions	185	185	185
Staff-Years:			
Ceiling	202	192	192
Non-Ceiling	10	10	10
Total, Staff Years........	212	202	202

NATIONAL AGRICULTURAL LIBRARY

CLASSIFICATION BY OBJECTS

1989 and Estimated 1990 and 1991

		1989	1990	1991
Personnel Compensation				
	Headquarters.............	$6,007,361	$5,905,173	$6,122,185
11	Total Personnel Compensation.....	6,007,361	5,905,173	6,122,185
12	Personnel Benefits	954,609	938,890	959,618
13	Benefits for Former Personnel.......	3,658	--	--
	Total Pers. Comp. & Benefits.............	6,965,628	6,844,063	7,081,803
Other Objects:				
21	Travel.............	132,014	154,043	157,000
22	Transportation of Things...........	20,016	21,000	22,000
23	Communications, Utilities and Other Rent.............	664,117	700,000	750,000
24	Printing and Reproduction......	72,077	80,000	90,000
25	Other Services.....	3,511,833	3,961,564	4,254,367
26	Supplies and Materials........	1,507,008	1,600,000	2,399,000
31	Equipment..........	799,539	850,000	900,000
41	Grants.............	451,830	465,330	118,830
	Total Other Objects	7,158,454	7,831,937	8,691,197
	Total Direct Obligations	14,124,082	14,676,000	15,773,000
	Position Data:			
	Average Salary, ES Positions	$75,500	$81,400	$101,000
	Average Salary, GS/GM Positions	$29,019	$30,093	$30,664
	Average Grade GS/GM Positions	8.54	8.54	8.54

NATIONAL AGRICULTURAL LIBRARY

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

National Agricultural Library

For necessary expenses of the National Agricultural Library [$14,676,000] $15,773,000: Provided, That this appropriation shall be available for employment pursuant to the second sentence of section 706 (a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed $35,000 shall be available for employment under 5 U.S.C. 3109: Provided further, that not to exceed $675,000 shall be available pursuant to 7 U.S.C. 2250 for the alteration and repair of buildings and improvements: [Provided further, that $385,000 shall be available for a grant pursuant to section 1472 of the National Agricultural Research, Extension and Teaching Policy Act of 1977 (7 U.S.C. 3318)].

The change deletes language providing funds in FY 1990 to the Leflar School of Law, University of Arkansas, Fayetteville, Arkansas by means of a grant.

NATIONAL AGRICULTURAL LIBRARY

Appropriation Act, 1990		$14,883,000
Budget Estimate, 1991		15,773,000
Increase in Appropriation		+890,000
Adjustments in 1990:		
Appropriation Act, 1990	$14,883,000	
Gramm-Rudman-Hollings Reduction (P.L.99-177)	-207,000	
Adjusted Base for 1991		14,676,000
Budget Estimate, 1991		15,773,000
Increase over adjusted, 1991		+1,097,000

SUMMARY OF INCREASES
(On basis of adjusted appropriation)

Items of Change	1990 Estimate	Pay Costs	Program Changes	1991 Estimate
Library Materials	$1,401,039	-0-	+$906,000	$2,307,039
Networking	123,900	-0-	+ 250,000	373,900
Leflar School of Law	380,000	-0-	- 380,000	-0-
All Other	12,771,061	+$321,000	-0-	13,092,061
	$14,676,000	+$321,000	+$776,000	$15,773,000

PROJECT STATEMENT
(On basis of adjusted appropriation)

	1989 Actual		1990 Estimated			1991 Estimated	
	Amount	Staff Years	Amount	Staff Years	Increase	Amount	Staff Years
1. Agricultural Library Services for Research and Education	$13,824,082	192	$14,380,000	182	$+1,097,000 (1)	$15,477,000	182
2. Repair and Maintenance of Facilities	300,000	---	296,000	---	---	296,000	---
Unobligated Balance	143,918	---	---	---	---	---	---
Total available or estimate	14,268,000	192	14,676,000	182	$+1,097,000	15,773,000	182
Gramm-Rudman-Hollings Reduction	---	---	207,000	---			
Total Appropriation	14,268,000	192	14,883,000	182			

EXPLANATION OF PROGRAMS

The basic function of the National Agricultural Library (NAL) is to identify, acquire, disseminate, and deliver pertinent food and agriculture information to all scientists, researchers, administrators, and others working in agricultural fields in both the government and private sectors. To meet user needs, the NAL is working with libraries at land-grant universities and other institutions to develop a network to enhance access to information. NAL also maintains an extensive collection of agricultural publications and provides access to these publications through AGRICOLA, its master bibliographic database. The NAL also provides current awareness and retrospective searches on worldwide agricultural literature through other computer-based systems of interest to agricultural scientists and educators.

One essential NAL program involves advanced information technologies. The NAL has intensified its efforts to enhance and expand its information-providing capabilities by testing the exciting possibilities of the new technology, including computer-based video technology, both often coupled with recently developed optical scanning and developing laser technology, and artificial intelligence software. The NAL staff strive to identify and evaluate these advanced technologies to determine their potential for improving agricultural information access and use. As these advanced technologies are applied to specific projects, NAL works to transfer their use to other agricultural organizations, which could benefit from their adoption. Such technologies have great potential for making information more widely available in a more timely way and in greater depth than ever before. By using advanced information technology, NAL will be better able to promote the organization and availability of agricultural information to the national and international agricultural communities.

The NAL serves a dual role as the primary literature source for the American agricultural community and as a national authority among libraries and information centers here and abroad. As part of its responsibility for processing of agricultural serials, the NAL recently became a self-authenticating member of the Cooperative Online Serials (CONSER) Project coordinated by the Library of Congress. NAL also has obtained independent status in the Library of Congress' National Coordinated Cataloging Operations (NACO) project to build a national name authority file for publications. The NAL also is cooperating with the National Library of Medicine on sharing collection responsibilities for veterinary science, human nutrition, literature, and biotechnology.

In an effort to improve services in particular subject areas, the NAL has established specialized information centers to provide enhanced services to current clientele as well as to develop new service relationships with the public and private sectors. The purpose of the centers is to focus or concentrate activities in the areas of great interest to the Department of Agriculture, the agricultural community throughout the Nation, and the public. NAL is able to take a proactive approach that involves a heavy emphasis on outreach and networking activities. In addition, information center staff concentrate their efforts on strengthening the NAL collection and developing information products. Information centers have a diverse audience. While agricultural researchers have been a traditional primary audience for NAL, information center clientele also include educators, consumers, and the private sector to a greater degree. Currently, NAL has information centers on Agricultural Trade and Marketing; Alternative Farming Systems (Low Input/Sustainable Agriculture; Animal Welfare; Aquaculture; Biotechnology; Critical Agricultural Materials; Family; Fiber and Textiles; Food and Nutrition; Food Irradiation; Horticulture; Rural Development; Youth Development; Technology Transfer; and Water Quality.

Justification of Increases

(1) A net increase of $1,097,000 consisting of:

(a) An increase of $906,000 to provide funding for library materials ($1,401,039 available in FY 1990).

Need for Change.

Agriculture researchers and educators may experience greater difficulty in locating information because rising costs and currency fluctuations have eroded NAL's ability to maintain a collection of library resources to satisfy the user needs. These factors have also affected NAL's ability to serve as a national information service with world wide coverage of vital agricultural and scientific information.

Cost increases have affected NAL's ability to procure journal literature. Overall prices have escalated by as much as 171% since FY 1978. The cost of foreign titles has increased by approximately 192% over the same period. As a scientific and technical information library on agricultural information, NAL has been especially hard hit because the prices of science journals have increased more rapidly than those in other disciplines. From 1986 to 1988, the average price of a humanities title increased 20.6%. The average price of a social science title increased 24.8%, while the average price for science titles increased 37.5%. Furthermore, in recent years, many publishers have imposed extremely high differential rates for library subscriptions as opposed to those for individuals. Book prices have also escalated to the point that has prevented NAL from securing books essential for the scientific community. The average cost of a book published in the United States in 1988 is $33.63, while the average price of an agricultural book is $48.58, biology is $77.38, and chemistry is $90.44.

To cope with the spiraling costs of vital library materials, NAL has cancelled serial subscriptions and curtailed other purchasing programs. These necessary steps decrease world wide coverage of important agricultural developments, delay document delivery to users since borrowing from other libraries must occur, and increase user frustration. As a result, NAL is losing its value as a last resort nationally for agricultural library materials.

Increased research and extension activities also dictate the need for NAL to more fully develop a capability to service the information needs of scientists and others.

Nature of Change.

These funds will provide NAL with the ability to procure library resources necessary for use by the agricultural community.

(b) An increase of $250,000 to expand networking ($123,900 available in FY 1990).

Need for Change.

Users must have rapid access to information which is crucial to scientific research. NAL must take the lead for coordinating basic services available from the agricultural library community. Networking is essential to avoid duplication of efforts, to implement resource sharing of specialized collections, coordinate processing and provision of services, develop a clearinghouse and referral center as part of the network, and maintaining an updated directory of agricultural information services on-line.

There is a need to expand and improve the national agricultural information network by: reducing unnecessary duplication of processing of materials, increasing resource sharing in cooperation with ARS and other agricultural libraries; and improving usefulness of the AGRICOLA database to scientists. NAL will continue to work cooperatively with 1862 and 1890 land-grant university libraries to develop and operate a network that will provide agricultural information to the user expeditiously.

NAL must increase its educational assistance to its users, its staff, and other libraries, using up-to-date instructional technology to extend its reach. Because of the rapidity of change in library and information service methodologies and technologies, continuing education in agricultural librarianship is essential to maintain effective network program.

Nature of Change.

Funds proposed are required to develop and implement a coordinated plan which will serve as a framework for the establishment and continuing coordination of specific cooperative projects having a bilateral and multi-lateral impact, and to initiate certain significant national network programs.

Another very significant cooperative effort within this area is the joint text digitizing project where 44 Land-Grant Universities have joined with NAL to plan and fund a 2-year project to digitize library materials for patrons use and for preservation. At the completion of this project, the model will be basis for developing a national program involving a number of libraries in capturing this data in electronic form.

A project with North Carolina State is evaluating the transmission of high resolution images of scientific text and graphics for which commercial facsimile is unsatisfactory. As this is completed, it will be extended to a number of libraries which will lead towards a national system for disseminating the data captured in the text digitizing program. Scientists will have access to this data from terminals at the work station.

NAL will also provide the infrastructure and support for network meetings, and strengthen cooperative development of network services and the specialized collections on which they are based. Other cooperative programs in research and development of useful information technologies will be encouraged. NAL will also provide the training necessary to implement and maintain appropriate services throughout.

This will build on existing cooperative efforts, such as the project involving over 40 Land-Grant libraries that create bibliographic records of their state agricultural publications for the AGRICOLA database. This NAL Land-Grant state publications project is one in which institutions cooperate in the acquisition, cataloging, indexing and provision of document delivery of state agricultural publications. As a result, many state publications that previously were not available can be searched and used by the world. In addition, NAL can turn resources previously used to catalog state publications to the cataloging of other U.S. documents.

In support of ARS, NAL is developing an information network for ARS field libraries, and users at ARS field stations without libraries. The network structure will be state of the art, cost effective, and more fully integrated with the resources of the NAL and the agricultural information network. This initiative will use advanced and improved information delivery systems and services to ARS scientists, avoiding costly duplication of collections in ARS, and assisting NAL to keep abreast of key user needs.

NAL will continue providing USDA researchers with subject related current awareness services from the most appropriate databases, and will continue supporting network systems that supply library services to USDA researchers from the Land-Grant University Libraries at their field locations.

(c) An increase of $213,000 for the 1989 pay raise and $108,000 which represents 50% of the 1991 raise. The remaining 50% of the 1991 pay raise and the total 1990 pay raise are being absorbed.

(d) A decrease of $380,000 for the Leflar School of Law, University of Arkansas ($380,000 available in FY 1990).

Need for Change.

The funds are provided for the operation of an agricultural law library in the Leflar School of Law, at the University of Arkansas. The grant was made in FY 1990 and is no longer supported.

Nature of Change.

Continued funding is not supported in the FY 1990 budget.

NATIONAL AGRICULTURAL LIBRARY

GEOGRAPHIC BREAKDOWN OF OBLIGATIONS AND STAFF-YEARS
1989 And Estimated 1990 and 1991

	1989		1990		1991	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
District of Columbia...	174,222	5.3	188,288	5.4	194,485	5.4
Maryland................	13,949,860	186.7	14,487,712	176.6	15,570,515	176.6
Total, Available or Estimate............	14,124,082	192	14,676,000	182	15,773,000	182

NATIONAL AGRICULTURAL LIBRARY

Status of Program

The National Agricultural Library (NAL) is one of the most heavily used and largest agricultural libraries and information services in the world, serving as the national resource for the collection and dissemination of information on all aspects of agriculture. As one of three national libraries, together with the Library of Congress and the National Library of Medicine, NAL fulfills national and international responsibilities, in conjunction with its USDA role. It acts as the coordinator and primary resource for a national network of State land-grant university libraries working together to deliver information to all sectors of the population. As the designated U.S. center for the international agricultural information system, NAL is actively involved in enhancing global access to agricultural data.

The basic services provided by the Library reflect the national and international nature of its mission. AGRICOLA, the Library's master bibliographic database, consists of 2.7 million computerized citations to books and articles on worldwide agriculture. The database tapes are marketed through the National Technical Information Service (NTIS), U.S. Department of Commerce, and can be accessed here and abroad through commercial vendors. The NAL collection, on which AGRICOLA is based, contains books, journals, maps, audiovisuals, and microcomputer software obtained through purchase, gifts, and exchange.

The NAL lends books and provides photocopies of documents, responding to more than 150,000 requests for such materials each year. Through a series of new specialized information centers responsive to current concerns, it provides comprehensive, indepth reference and referral assistance to Department policy makers, scientists, and USDA personnel engaged in service to the public. Assistance is also given to other Federal and State agencies, Congressional staffs, industry, and to the general public when local and regional resources have been exhausted.

Current Activities

As a dynamic organization, NAL is continually searching for ways to enhance its responsiveness to its current clientele and in the process reach new user groups. To help accomplish this goal, NAL has created information centers on various subjects and in doing so has worked with support groups in industry, Federal and state agencies, and the scientific community to establish these centers as national focal points for information dissemination activities. The designation of a topic as an information center will generate increased activity on several fronts including collection development, information products, and outreach. Since the introduction of the information centers concept, a number of centers have been established and are operational. They include Agricultural Trade and Marketing, Alternative Farming Systems, Animal Welfare, Aquaculture, Biotechnology, Critical Agricultural Materials, Family, Fiber and Textiles, Food Irradiation, Horticulture, and Rural Development. Centers in the early development stages include Technology Transfer, Youth Development, and Water Quality. The model for all of these Centers is the Food and Nutrition Information Center which has been in existence since 1970 as a special unit of the NAL.

The NAL and land-grant libraries work cooperatively to provide improved coverage of state agricultural publications. Through their combined efforts, the national and state libraries can collect, process, and provide document delivery for state experiment station and extension service publications. Land-grant library directors have designated contact persons for coordination of activities with NAL staff. In a few cases, it was established that state libraries or other university libraries rather than land-grant libraries had archival responsibility for state agricultural publications. NAL also works with these institutions to obtain a comprehensive collection of state publications. Land-grant libraries are providing NAL with information for the direct acquisition of state agricultural publications, and cataloging an increasing number of state publications for inclusion in AGRICOLA.

The NAL engages in a wide range of international activities relating to worldwide collection and dissemination of information on agriculture and related subjects. Its AGRICOLA database is accessible online in 30 foreign nations. The Library is the designated U.S. center for AGRIS, the international agricultural information system of the United Nations' Food and Agricultural Organization (FAO) and provides essential support to the FAO's Aquatic Science and Fisheries Information System (ASFIS). Under an arrangement with the CAB International, the NAL is augmenting and updating the CAB Thesaurus, an agricultural vocabulary. Jointly with CABI, NAL has produced an International Union List of Agricultural Serials which will be published by CABI in FY 1990. With NAL encouragement, including greater personal and institutional contacts, the exchange of agricultural information with both the Peoples' Republic of China and the Soviet Union has expanded significantly. NAL also encourages countries to index more of the publications originating in their own country as NAL concentrates its resources on indexing U.S. literature.

NAL conducts a national education and training program designed to inform actual and potential users about NAL operations, resources, and services. NAL offers workshops and demonstrations in cooperation with agricultural institutions, professional and trade organizations across the country. The emphasis in this program is on the use of online bibliographic files and other computer services. An interactive video disk is expanding training capabilities both in this country and internationally. Briefings, tours and exhibits are provided for domestic and foreign visitors to the NAL.

The NAL is developing network plans in a systematic fashion while seizing opportunities for specific cooperative projects which can eventually serve as the framework for the broad network. One of these cooperative activities is the Aquaculture Library Network, created under the leadership of the NAL to support four Regional Aquaculture Centers. The Network members seek to provide an information linkage between the extension and research development which will take place within each region. In another cooperative activity, coordinating the development of conspectuses and collection coverage in the field of agriculture, NAL has negotiated an agreement with the National Library of Medicine in the fields of veterinary science and nutrition and currently is negotiating biotechnology and animal welfare. These agreements assure complete coverage in these fields while avoiding unnecessary duplication of resources. Several new cooperative projects are underway utilizing new information technology. As we continue to develop ISIS, NAL's integrated library system, we are exploring innovative approaches to expanding the benefits to other USDA information providers. A project is underway to provide online dial-up access to the system at NAL for the Agricultural Research Service (ARS) regional libraries. Another related project will allow ARS libraries to include their holdings in ISIS. NAL and Extension Service are working jointly to develop a CD-ROM product containing a variety of agricultural information aimed at the state extension worker. NAL is working with ARS to produce a CD-ROM on fungi. A project is underway with NAL and Economic Research Service (ERS) to develop two CD-ROM simulation products containing ERS publications.

In 1988, the National Agricultural Library was instrumental in the formation of an agricultural libraries and information network, now called the United States Agricultural Information Network (USAIN). The primary goal of this network is the provision of a forum for the discussion of agricultural information issues. Through the network, NAL, land-grant, and special libraries will be able to work together to generate cooperative programs that will improve access to agricultural information. USAIN's current initiatives are: the commencement of a membership drive, fund raising, establishing the charges for the committees, continuing the work of the text-digitizing group (a subcommittee of the Telecommunications & Networking Committee), and planning and holding the first program meeting.

NAL is also networking with the USDA Office of Public Affairs and several other USDA agencies to place the centralized USDA files of current and historic photographs as well as photo collections of other USDA agencies on laser video disk. The project serves to increase access to the collections by a wide audience and to improve productivity in the management of the collections.

"ALF" (Agricultural Library Forum), an electronic bulletin board system, now in its second year of operation, provides remote, around-the-clock access to information sources, services, programs, activities, and assistance pertinent to agricultural interests. Through the bulletin board conferences have been set up allowing participants to communicate with each other electronically.

They constitute special interest groups for focused discussion of topics including biotechnology, groundwater, and alternative agricultural opportunities. Updated versions of text files, lists, and programs heretofore available only in printed form, are now readily available nationwide and even worldwide at electronic speeds. ALF has now logged over 5,000 incoming calls. Current users number over 700. Almost 1,000 messages have been entered by users of the system. ALF provides timely and remote access for users nationwide to a broad range of information at minimum cost and high flexibility and effectiveness.

Acquisitions of agricultural materials from 150 countries and in more than 30 languages continues to be a major activity in carrying out the mission of the library components of NAL. Translations of publications are now available to Library users. Other primary activities for fiscal years 1989, 1990, and 1991 are as follows:

	Estimated Productivity		
Types of Activities	FY 1989 Actual	FY 1990 Estimate	FY 1991 Estimate
Serial Issues Added	117,308	130,000	130,000
Number of Titles Cataloged	22,492	23,000	23,500
Articles Indexed	80,100	85,000	90,000
Pages Preserved	2,519,000	6,731,000	6,621,000
Document Requests Filled	239,009	243,353	249,457
Reference Inquiries Answered	42,031	44,133	46,340
Automated Searches Conducted	23,756	24,945	26,192
Current Awareness (CALS) Searches	92,373	101,610	111,771
Current Awareness (CALS) Profiles by all databases	20,734	21,771	22,859

A major function of the bibliographic program is organization of materials for use of researchers and announcement of newly published research to the agricultural community. This includes cataloging books and journals acquired for the collection, and indexing journal articles, conference proceedings, and reports selected for their importance to agricultural research and education. Resources of the collection are made available through direct loan, interlibrary loan of books and photocopy of journals articles. Requests for documents from USDA field employees are handled locally in 37 States in cooperation with land-grant university libraries whenever possible, with the NAL serving as a backup for document delivery.

In response to increasing demand for technical information on agriculture, the NAL continues to expand its collection development and information access programs through coordination of holdings with and among land-grant universities and through international exchange programs with foreign governments, universities, and research centers. It initiates and implements cooperative indexing and cataloging projects with public and private institutions and strengthens agricultural library and information activities nationally through development and adoption of standardized formats and processing procedures essential for national networking.

The NAL must also provide for collection preservation. This includes the microfilming and restoring of important documents, unbound serial issues, newspapers, and historical materials. In the past NAL supported a nationwide project to assist in microfilming documents of all land-grant institutions, especially the bulletins, circulars, reports, and other miscellaneous publications of the State agricultural experiment stations and agricultural extension services. A promising alternative to microfilming is the full-text digitizing technology. The emphasis in preservation will possibly move in that direction in the future. The preserved collection is both a valuable research tool for a wide variety of subjects and a practical reference resource for the farmer and the lay public. A comprehensive preservation planning program study has been initiated to investigate all aspects of preservation activity at NAL from physical and environmental conditions of the collection to disaster control, staff and user education, and inter-institutional cooperation. The ultimate purpose of the study is to develop and implement an effective program for ensuring the availability of important agricultural information for future generations of researchers and other users.

The first phase of the National Agricultural Text Digitizing Project will soon be completed. This is a cooperative project undertaken by NAL and 44 land-grant university libraries to evaluate new methods of capturing and disseminating full text information on CD-ROMs. Three CD-ROM products have been distributed to project participants for their evaluation. One disk is on aquaculture, one on Agent Orange, and one done in conjunction with the Consultative Group on International Agricultural Research (CGIAR) on food, science and agriculture. NAL has also begun converting a unique collection of materials on food irradiation into machine-readable form to facilitate access.

The National Science Foundation's INTERNET telecommunications network is serving as the backbone for a new project which will enable NAL to deliver documents to other libraries by transmitting page images electronically at very high speed.

NAL also utilizes advanced information technology to extend its capabilities and improve its responsiveness. NAL has moved to the leading edge of new technology in information science. NAL has pioneered projects on compact disks, interactive video disks, full text digitization, optical scanning technology, electronic telecommunications of library materials, expert systems, and video disk for storage of photographs. Many of these projects result specifically in improved services to individuals through faster response or more complete coverage.

Laser technology has the potential to significantly change the means by which publications are distributed and used. With the right retrieval system every word, phrase, and illustration in a publication becomes immediately accessible.

NAL is investigating laser scanning systems as a means for providing much needed access to state agricultural publications. A national cooperative project including NAL and the land-grant libraries has been initiated to test this technology. Using a system which digitizes both the page image and the text on the page, users will be able to search the text of documents by any word or combinations of words. Planning is underway to develop a national program for implementation of the system and selecting publications to be included.

Selected Examples of Recent Progress

NAL Preservation Study—In FY 1989, NAL completed the ARL (Association of Research Libraries) study of the condition of materials in the two million volume collection. Dozens of other research and land-grant libraries throughout the country previously conducted similar investigations with the alarming discovery that large portions of their collections were in various states of disintegration. The study performed at NAL demonstrated that similar conditions existed at NAL. Scientists and research administrators are rapidly losing access to scientific and technical reporting essential to their programs. About 28% of the NAL collection has to be transferred to another medium (electronic or film) prior to further use. About one fourth of the collection is also in a readily recognizable transitory state requiring preservation attention to prevent further deterioration and most of the remaining materials will eventually progress to that transitory state of deterioration within a relatively short time. A preservation program is essential in order to prevent the loss of agricultural research findings from the remaining core of scientific knowledge. NAL is reviewing the findings of the study and is preparing recommendations for handling the problem.

Networking - ARS Field Libraries Accessing ISIS—The ARS Libraries have been accessing ISIS, NAL's integrated library system, since February 1988 in order to evaluate the capabilities of electronic networking to provide better access to agricultural literature through the AGRICOLA database. The study will also evaluate adding the ARS Libraries' holdings information to ISIS, thereby making ISIS an agricultural union catalog. ARS Libraries have valuable collections that should be shared, and this will allow scientists and researchers to be able to identify local materials as well as to easily request other materials from NAL.

NAL/ERS/CD-ROM Simulation—In cooperation with USDA's Economics Management Staff (EMS) and the Economic Research Service (ERS), NAL is working to develop two CD-ROM simulation products composed of scanned images of ERS publications, the ASCII text files for these images, and related LOTUS worksheet files all created initially by the ERS. The purpose behind this project is twofold: first, to determine the feasibility of and the requirements for producing a CD-ROM product composed of ERS publications for general distribution and second, to determine the level of equipment a user must have to successfully use this CD-ROM end product.

National Agricultural Text Digitizing Project—This cooperative project between NAL and 44 land-grant universities, to test new methods of capturing and disseminating full text information, is well underway. The first CD-ROM, entitled Aquaculture I, was produced in-house and distributed to the 44 participating libraries for evaluation. User response in the form of evaluation questionnaires is now being analyzed by the University of Vermont. A second CD-ROM, produced by the Consultative Group on International Agricultural Research (CGIAR), has also been distributed and is now being evaluated at the 44 sites. A third CD-Rom on Agent Orange was distributed in December 1989. All disks contain both the full text and graphics of the printed publications, and the information is searchable at word level. Each disk employs a different retrieval package, which is also under evaluation.

Transmission of Digitized Test—NAL has initiated another ground-breaking effort in its project with North Carolina State University to investigate and evaluate using high-speed telecommunications lines to deliver documents to widely separated sites. We are using the National Science Foundation's INTERNET telecommunications system which connects almost all major U.S. universities to immediately send page images, digitized at high resolutions, to the university libraries instead of using the postal system. This methodology could prove to be invaluable in providing timely nationwide access to information in remote locations.

Lists of Journals Indexed (LJI) Database—NAL has created and maintains a database containing pertinent information regarding journals that are currently indexed in AGRICOLA. The database file was created to aid in the annual publication of the List of Journals Indexed in AGRICOLA. The database contains nearly 2,000 records and is 1.2 megabytes in size. Each record consists of 20 fields, including title, NAL call number, abbreviated title, publisher, place of publication, and International Standard Serial number (ISSN). Additional information contained in each record includes the language of the publication, indexing coverage of the publication (cover-to-cover or selective indexing), subject category code(s), country of publication code, and other information of internal/administrative interest. The LJI database has proven useful for other purposes, such as identifying journals that are indexed for AGRICOLA with a particular subject, country, or language in common.

List of Journals Indexed in AGRICOLA 1989—NAL has published the first authoritative list of journals indexed in AGRICOLA available since 1983. The List of Journals Indexed in AGRICOLA 1989 is 117 pages and arranged alphabetically by full title. In addition to the full title, each entry includes the abbreviated title, NAL call number, International Standard Serial Number (ISSN), publisher, and place of publication. This publication will be published annually and future editions will include indexing coverage, listings by subject and abbreviated title, and identify journals abstracted in AGRICOLA.

American Floral Endowment Database—NAL has created, with the support of the American Floral Endowment (AFE), an on-going documentation and reporting system for the Endowment-sponsored research and education grants awarded since its inception in 1961. With a grant from the AFE, NAL has designed the American Floral Endowment Database to provide ready access to information regarding research and education grants and to citations of the resulting publications. This information may be used in grants planning to avoid costly duplication, to evaluate past and future areas of industry interests and emphasis, to follow-up on the conduct and documentation of work in progress. The database will also serve as a valuable reference source for contracts. The information contained in the AFE database represents all of the research projects funded by the American Floral Endowment. There are actually two databases, one containing grant information and the other containing citations to the resulting publications. The 450 records in the AFE databases are linked to each other via the project number. The database can be searched by subject, project leader, title word, university, and state. Record keeping and calculations can be done as well, e.g.: Number of records on a subject, total grant money awarded to a university, etc.

Electronic Bulletin Board—NAL has been working with the Cooperative State Research Service to initiate an electronic bulletin board for the National Biological Impact Assessment Program. The focus of the board is a risk assessment of the environmental release of genetically engineered organisms. Information Center staff will be responsible for gathering and preparing data on information sources, patents, and yellow pages (directories, newsletters, databases, videotapes, germplasm regulations, guidelines, laws and executive orders, research sites and institutional Biosafety Committees).

Office of Public Affairs (OPA) Optical Disk—This interagency project seeks to improve service and access to USDA photos through production of finding aids using laser image storage in conjunction with a word searchable, subject oriented, magnetic database. Thousands of images and corresponding data records have been included on the 12-inch disk. A testdisk has been received and, after minor problems are corrected, the final product will be pressed. Negotiations are underway for distribution of the OPA optical disk during early 1990.

WITNESSES

Page
Carlson, W.D. 223
Carter, M.E. 1
Dewhurst, S.B. 1, 223, 483, 593
Harris, C.I. 223
Hess, C.E. 1, 223, 483, 593
Howard, J.H. 593
Johnsrud, M.D. 483
Jordan, J.P. 223
Knipling, E.B. 1
Pisa, M.G. 593
Plowman, R.D. 1
Rankin, R.R. 483
Victor, J.R. 1

INDEX

Agricultural Research Service

Page

Acarine Mite 23
Accomplishments:
  Committee 9
  Research 5
  Other 7
Acid Rain 45
Aflatoxin Research 62, 87, 103
Africanized Bees 19
Agri Research and Development Consortium 51
Agriculture—Economic Importance of 11
Aircraft Owned by ARS 75, 222
Animal Rights/Animal Welfare 108, 121
Aquaculture Research 52, 119
Arid Lands 110
ARS Laboratories 3
BARD 121
Barley Yellow Dwarf Virus 48, 111
Biodegradable Plastic 48, 103
Biographical Sketch—Charles E. Hess 1
Blueberry Research 46
Bovine Leukosis 124
Brucellosis Research 49, 114, 115
Budget Recommendations:
  Fiscal Year 1991 .... 4, 7, 86
  AZ, Phoenix 41
  FL, Gainesville 41
  GA, Athens 41
  GA, Tifton 42
  IA, Ames 42
  MD, Beltsville 42
  NE, Clay Center 42
  NY, Ithaca 43
Budget Reductions 9
Buildings and Facilities:
  National Seed Storage Lab 75
  CA, San Francisco (LAIR) 78
  GA, Athens 76
  MD, Beltsville 76
  National Arboretum 77
  PIADC 77, 78
  Yakima Vegetable Lab 77

Page
CA, Fresno 83
Catfish Research 53
Competitive Grants 10
Congressional Directives, Response to 148
Contingency Fund 39
    LA, Baton Rouge 40
    North Carolina 41
    PA, Wyndmoor 40
    TX, Weslaco 40
    VI, St. Croix 40
Cotton Ginning Laboratories 109
Cranberry Research 46
Durant Water Quality Lab 120
Dwarf Bunt Research 54
Explanatory Notes 165
Filbert Blight, Eastern 54
FL, Orlando Lab 108
Food—Quality and Safety 106
Formosan Termite 99
Fruit Flies 88
Funding Versus Staff 38
Future Concerns 7
Geminiviruses 126
Germplasm:
    Clonal Repository 97
    Collections 69
    Repositories 68, 98
Global Change 15, 143
Gramm-Rudman Sequestration 43
Grapes:
    Muscadine 56
    Sulfur Dioxide on Table 63
Grasshoppers and Mormon Crickets 62
Guarding Dog Program 44
Guayule 60
Human Nutrition Research 58
Ink, Soybean-Based 57
IR-4 Program 58
Jojoba 61
Kenaf 56, 118
Language, Bill 37
Low-Input Sustainable Agriculture 17
Maple Syrup Producers Manual 24
Meadowfoam 55
Meat Animal Research Center 85
Miscellaneous Contributed Funds 30
Mission Linked Grants 12
MN, Morris 120
Muscadine Grapes 56
Mycoplasma 64
Narcotic Plants 39, 122
National Arboretum 68
National Research Initiative 2, 84
National Seed Storage Lab 75, 85

Page
Native U.S. Plants 43
New Products From Sugarcane 97
Nitrogen Fixation 38
Object Classification Table 37
Oceanic Institute 99
Off-Flavor Research 53
OK, Durant 120
Oncogens 123
Orange, New Variety 44
Other Funds Available to ARS 24
Passenger Motor Vehicles 75, 222
Pecan Aphid 55
Pesticides, Alternatives to 124
Plant Gene Expression Center 70
Plant Genetics Research 102
Plant Genome Mapping Program 38, 79
Plant Stress and Water Conservation Lab 82
Potato Research 50
Priorities, Support for Ongoing 3
Prioritization 113
Purdue University, Plant Genetics 102
Remarks:
  Assistant Secretary 2, 127
  Administrator 5, 138
  Opening 1
Remote Sensing 45
Repair and Maintenance of Facilities 66
Research Budget, USDA 110
Research Facilities:
  New 67
  Staffing of 70
  Released 68
  Needs 8
Research, Importance of 100
Research Priorities 107
Russian Wheat Aphid 47
Satellite Imagery for Crop Inventories 45
Screwworm Program 44, 105
South Central Agric Research Center 114, 116
Soybean-Based Ink 57
Sugar Research 100
Sweet Potato Whitefly 65, 125, 126
Systematic Entomology Lab 63
Tropical/Subtropical Research 68
Urban Pest Research 63
Variety Survey 122
Varroa Mite 23
Water Quality and Quantity 13, 104, 115, 120
Weeds, Noxious/Aquatic 111

Cooperative State Research Service

1890 Institutions Capacity Building Grants 245
Acid precipitation 255

Page
Aflatoxin research 256
Agricultural diversification and speciality crops, Hawaii 257, 351
Agricultural related research 246
Agricultural trade 258
Agricultural utilization 258
Alfalfa research 360
Alternative cropping systems in the southwest 259
Alternative crops 260
Alternative pest control, Arkansas 261
Alternative to Dinoseb, Oregon 261
Animal health research 262, 335, 338
Animal rights vs. animal welfare 376
Animal science food safety consortium 264
Apple quality research 265, 373
Aquaculture centers 253, 349, 375
Aquaculture research 265
Aquaculture research, Stoneville, Mississippi 266
Asparagus yield decline 267, 373
Bean and beet research 268, 373
Belgian endive 269
Blueberry shoestring virus, Michigan 269, 373
Bovine leukemia 378
Broom snakeweed, New Mexico 270
Brucellosis research 357
Carryover funds 246
Celery fusarium, Michigan 271, 374
Center for International Trade Development 358
Center for Tropical and Subtropical Agriculture 344, 345
Chesapeake bay aquaculture 272
Competitive research grants 360, 364
Cranberry/blueberry disease and breeding, New Jersey 272
Dairy and beef photoperiod, Michigan 273, 374
Dairy goat research, Prairie View A&M, Texas 274
Dark-End syndrome of potatoes 275
Delta rural revitalization, Mississippi 275
Dried bean research, North Dakota 276
Equine-Bovine Biotechnology Center 355, 357
Expanded wheat pasture, Oklahoma 277, 358
Explanatory Notes 391
Export services, Oregon 277
Federal administration 338
Fire ants 333
Fiscal year 1991 budget request 233, 235
Floriculture, Hawaii 278, 348
Food and Agriculture Policy Institute 279
Food Marketing Policy Center, Connecticut 280
Food systems research group 281
Food toxicology 327
Global change 352
Grasshopper biocontrol, North Dakota 281
Groundwater research 241, 364
Guayule 239
Gulf Coast shrimp consortium 349
Higher education 246, 254, 367

Page
Honoraria 339
Human nutrition, New York 282
Indirect research cost 366
Integrated orchard management 283
Integrated pest management 283, 353
Integrated production systems, Oklahoma 285, 356
International livestock program, Kansas 286
Iowa biotechnology consortium 287
Lake States Forest Products Trade Center 372
Livestock and dairy policy, New York and Texas 288
Low-Imput agriculture 253, 290, 377
Lowbush blueberry research 289
Maple research 291
Marine tropical fish industry 348
Michigan Biotechnology Institute 292, 374
Michigan projects 373
Midwest Plant Biotechnology Consortium 292
Milk consumption 293
Milkweed research, Nebraska 294
Minor crop pest control 295, 346
Minor use animal drugs 295, 374
Mosquito research, riceland agroecosystem 296
Multi-Cropping strategies for aquaculture 298, 348
National Biological Impact Assessment Program 298
National Research Initiative 339, 351, 360, 377
New uses for agricultural products, Ohio 299
Nonfood agricultural products 300
Object classification 239
Obligations under other USDA appropriations 237
Oil from jojoba 301
Operation small farm 302
Oregon/Massachusetts biotechnology partnership 302
Other Federal funds 238
Pacific Basin 343
Peach tree short life 303
Pecan aphid/weevil research 359
Permanent positions 239
Pesticide clearance 244, 304, 353, 374
Pesticide impact assessment 306
Pesticide research 303
Pine bark beetle 334
Plant Science Centers 251
Plastics from cornstarch, Nebraska 307
Potato research 307, 374
Preservation and processing research 308, 356
Prime farmland reclamation 309
Pseudorabies research 342
Rangeland research 251
Regional barley gene mapping project 310
Regional implications of farm programs 311
Rural development centers 311
Rural economic development 313
Russian wheat aphid 313
Safflower research 314

Page
Sandhills grazing management practices 315
Seafood harvesting, processing and marketing 316
Seedstocks enhancement, North Dakota 317
Small Business Innovation Research Program 237
Soil erosion in the Pacific Northwest (STEEP) 317
Southwest consortium for plant genetics and water resources 319
Soybean cyst nematode 320
Statement of John Patrick Jordan 223, 380
Stone fruit decline 321, 374
Stored grain insects 321
Subirrigation research 322, 374
Sunflower insects 323
Supplemental and alternative crops 255
TCK smut 324
Tropical and subtropical research 325, 345, 350
Unobligated balances 244
Value added products 340, 354
Water management, Alabama 326
Water quality 242, 243, 245, 327
Wheat genetics, Kansas 328
Wood utilization research 329, 374
Wool research 330
World food systems 331
Youth science camp program 332

Extension Service

Accomplishments 483-484
Administrator's Statement 483
ATTRA 521
Budget Characterizations 533
Chesapeake Bay Regional Project 510
Colorado River Basin Salinity Control Program 492
Comm. On Reaching Limited Resource Audiences 513-514
D.C. Extension 524
EFNEP 486-487, 511-513
1890 Extension Facilities 498
1890 Institutions 486
Extension Apiarist 525
Famr Safety 499, 526
Federal Administration:
  American Pacific Project 502-503, 528-529, 530-531
  Crambe and Rapeseed 502
  Crop Simulation Project 505-506
  Documentary Films on American Agriculture 505, 531
  Farm Financial Management Project 501
  New England Vertebrate Project 503
  Object Class Table 522-523
  Presque Island Project 606-507
  Rural Development Project 502, 540-541
  Rural Education Model Project 504-505
  Rural Rehabilitation Project 506
  Rural Revitalization Project 503-504
  Source of Funds 522

Page
Usage of Information Centers 599
Usage of the National Agricultural Library 605
Water Quality Information Center 600
Water Quality Initiative 600
Youth Information Center 600

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